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FLIGHT

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Supersonic Haste

THOSE who, like Rear Admiral Sir Matthew Slattery, command positions of high responsibility in the aviation business know how easy it is to command the headlines with prophesies about supersonic airliners. *Flight's* files are bulging with supersonic quotes; and to them are now added those of BOAC's new chairman, who last week imparted to the Press his own positive views on the subject. They are reported on page 225 of this issue.

Briefly, Sir Matthew feels that while supersonic transport is difficult to justify, it will come "more or less regardless of the economic consequences," and he intends that "BOAC shall not be behind in the race." So let us, the admiral urges, "get on with it." He mentions 1968 as the "most optimistic" date for delivery.

Mindful of the cost to British aviation of bygone *folies de grandeur*, and mindful too of BOAC finances crippled by too fast a rate of re-equipment (we recall Sir Gerard d'Erlanger's words from Sir Matthew's chair only a fortnight ago), let us take a look at some other supersonic quotes in our files.

First, Mr M. M. V. Custance, Deputy Secretary of BOAC's proprietor, the Ministry of Aviation. Addressing—as the senior UK delegate—the General Assembly of the International Civil Aviation Organization in San Diego on June 16, 1959, he warned that it was "imperative" to co-ordinate supersonic progress with economic and social planning. "To get the best economic advantages and social changes for civil aviation," he said, "we in the United Kingdom think that it is up to governments to promote close co-ordination at a much earlier stage than we have been able to do in the case of the jets." This co-ordination should, he urged, be between governments, airports, airlines and manufacturers.

As was said in these pages at the time, here at last was a responsible voice speaking out in a responsible forum against the god of technological progress, excessive worship of which requires taxpayers to subsidize an airline industry which, for the most part, they themselves still cannot afford to use.

What the Select Committee said

Again, the Parliamentary Select Committee that examined BOAC and BEA said in its report published a year ago: "On past form, there is the danger of a panic rush by the airlines of the world to buy these supersonic aircraft before they have fully counted the probable cost." If the airlines tried to embark on a supersonic airliner race too early, the Select Committee said, "they will almost certainly run into financial difficulties." Such a race, the report added, however attractive it might seem at first sight to take advantage of scientific and technical advances, "may only end in the airlines of the world suffering severe financial losses which they will be unable to make good without help from their governments."

Sir Matthew is right to plan for supersonics, which will and must come. But should he not have spent his first days in the airline business seeking, quietly and behind the headlines, to sponsor international agreement to make supersonic haste slowly? Instead of so soon calling a let's-press-on-with-it news conference, perhaps thus shutting the door so wisely opened by the senior UK delegate to ICAO, could not Sir Matthew have discussed with the Aviation Minister—a new and receptive Minister—the possibility of opening the door further? International agreement to avoid a supersonic rat-race will not be reached easily; but it is still worth striving for.

FROM ALL QUARTERS

UN AIRLIFT: One of the C-130A Hercules of the 322nd Air Division, USAF, which visited Baldonnel Airfield to transport men of the 32nd Irish Infantry Battalion to the Congo

Fewer Victors

ON August 2 the Air Ministry announced "it has been decided to cancel some Victor Mark 2 aircraft at present on order for the Royal Air Force. This follows the examination of the numbers required in order to maintain the effectiveness of the strategic deterrent following the equipment of the V-bomber force with stand-off weapons."

Few major purchases or cancellations of defence equipment take place in this country without suggestions of "shock," "scandal" and "waste," and all three terms have been applied in this case. The official view, which *Flight* has no reason to doubt, would obviously be that a V-bomber carrying two GAM-87A Sky Bolt missiles could attack two targets in a single mission, whereas the same aircraft armed with a single Blue Steel could attack but one target. Since Bomber Command's striking strength is based on the need to inflict a certain carefully calculated damage potential, this fact reduces the number of aircraft required to maintain the desired deterrent force.

Detailed investigations have shown that both the Vulcan B.2 and Victor B.2 are quite capable of carrying a pair of Sky Bolts each. But, as has already been emphasized in this journal, the modifications required to the latter aircraft are considerably more extensive and would be proportionately more costly to carry into effect. It has been widely claimed that the curtailment of Victor B.2 production is a *quid pro quo* for the TSR.2, or that it is the result of Treasury pressure, the loss of one of these aircraft off the Pembrokeshire coast or the fact that Handley Page Ltd is not a member of one of the "big groups." There is no reason to believe that any of these factors have any real bearing on the question.

Sprite Order

WESTLAND announce that they have received an MoA contract for the development of the Sprite (P.531-2 Mk 1) 5/6-seat helicopter. Built by the Saunders-Roe Division, the Sprite is essentially the military variant of the Wasp, and is powered by an 885 s.h.p. Blackburn A.129 Nimbus derated to 650 s.h.p. The fuselage has been extended to give an additional 6in of length in the rear of the cabin, and the Sprite can be equipped for a wide range of military duties. The first has been flying since August 4.

X-15 Reaches 2,196 m.p.h.

ON August 4 Joe Walker, NASA test pilot, flew one of the two remaining North American X-15 research aircraft at 2,196 m.p.h. (M3.32). Leaving Edwards AFB, Cal, under the wing of its B-52 mother aircraft, it was released at 45,000ft. The LR11 rocket engine was brought to full power, and in the course of a straight climb to 78,000ft the peak speed was reached after 4min 15sec under power, with nearly dry tanks. The X-15, which is capable of much greater speeds, has thus passed the four-year-old 2,094 m.p.h. attained by the Bell X-2. These are not official records: for its speed to be considered by the FAI as a world record an aeroplane must take off under its own power.

BAC Posts

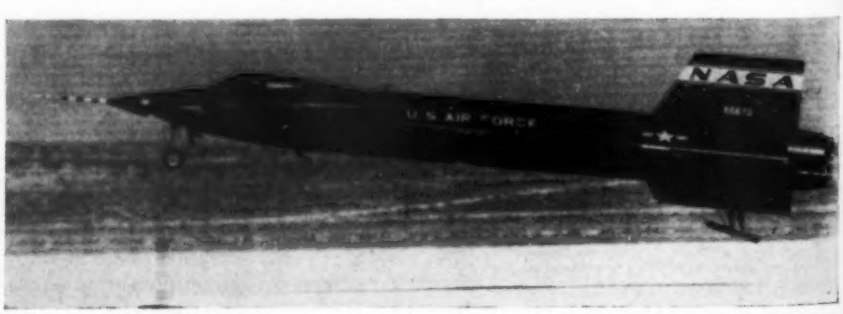
THREE appointments have been announced by the British Aircraft Corporation. Mr Allen H. C. Greenwood, AFRAeS, AFCAI, MIAS, is to co-ordinate aircraft sales and service within the Group, exercising this function in addition to his present duties as Director (Sales and Service) of Vickers-Armstrongs (Aircraft) Ltd. Mr G. R. Bryce, OBE, becomes chief test pilot of the corporation; and Mr R. P. Beamont, DSO, OBE, DFC, becomes deputy chief test pilot. It is further announced that as a consequence of Mr Bryce's appointment, Mr E. B. Trubshaw, MVO, is made chief test pilot of Vickers-Armstrongs (Aircraft) Ltd, Mr M. J. Lithgow, OBE, becoming deputy chief test pilot.

Messrs Greenwood, Bryce and Beamont

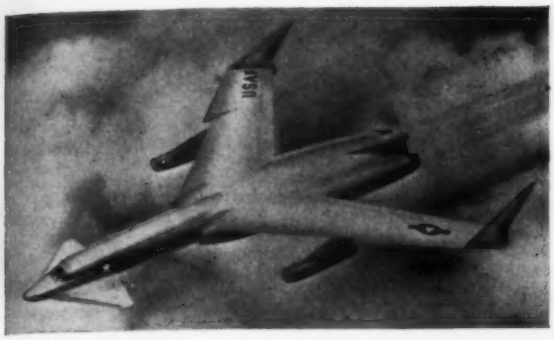
Mr Greenwood was made Director (Sales and Service) of Vickers-Armstrongs (Aircraft) earlier this year, having previously (since 1957) been deputy general manager of the company's factories at Weybridge and Hurn. Mr Bryce became chief test pilot of Vickers-Armstrongs (Aircraft) in 1955, when he was also made a special director of the company, an appointment he still retains. Mr Beamont is a special director of English Electric Aviation Ltd and also the company's chief test pilot, posts he still retains. He was the first to fly a British aircraft—a Lightning—at Mach 2 and holds three official point-to-point air records—all set up in Canberras across the North Atlantic.

Jack Davis

IT is with regret that we record the death of Jack Davis, European representative of Canadair Ltd. John Henry Davis was born near Birmingham in 1898; after service as a pilot in the RFC he joined a firm of chartered accountants in Paris, where he acquired fluent French and German. He later lived with his wife and daughter in Vienna, where he operated his own Hirtenberg aircraft, in which he flew to England in the summer of 1939. At the beginning of World War 2 he became works manager of the Rodney Works of the Bristol Aeroplane Co, and later became overseas sales manager. He received his final appointment in April 1949.



DOWN TO EARTH after attaining 2,196 m.p.h.: Test pilot Joe Walker brings in the X-15 (see news item above) to a nosewheel-and-skids landing on the dry lake bed at Edwards Air Force Base. Touchdown speed is in the region of 200 m.p.h.



***BELT AND BRACES:** It is now known that the Convair NX-2 projected nuclear-powered bomber for the USAF exists in several forms. One was illustrated in our July 27 issue; above is an impression of a variant with kerosine-burning engines in underwing nacelles*

IN BRIEF

British aircraft industry exports during June this year, £11,472,065, brought the half-yearly total to £76,494,146.

Wg Cdr E. E. Bullus, MP, has been appointed Parliamentary Private Secretary to the Minister of Aviation.

New president of the Bell Helicopter Co is Edwin J. Ducayet, who joined the company nine years ago.

Westland Aircraft Ltd have made a contribution of £17,500 to Southampton University's centenary appeal for the provision, over a seven-year period, of a readership in helicopter engineering.

Delivery of 66 American-built Lockheed F-104Gs to the West German Air Force is due to start next spring. The first European-built F-104Gs are expected to be delivered in 1962.

More than 90 per cent of the materials employed in the construction of the Bristol T.188 research aircraft have come from the Sheffield works of Firth-Vickers Stainless Steels Ltd. New alloys and new methods of fabrication have been developed.

We are now permitted to acknowledge the existence of the Rolls-Royce RB.153 and RB.161. The former has for some months been unofficially described as a VTOL lift engine of 4,960lb thrust. We are also permitted to state that the maximum thrust of the Rolls-Royce Avon RA.24R is 14,430lb; without reheat the rating is 11,250lb.

Blackburn Aircraft Ltd have announced that a load weighing 40,000lb (18 tons) was recently parachuted from a Beverley, this weight exceeding by 5,000lb the world record drop claimed by the USAF Air Research and Development Command. The Beverley drop took place ten months ago but information about it has been witheld for security reasons.

The development prototype of the AWA Argosy 660 military transport, G-APRL, made its first flight from the manufacturer's test airfield at Bitteswell, Leics, on July 28. The aircraft has a rear-opening door, for parachuting heavy equipment, and paratroop exits on either side of the fuselage. (Picture: page 230.)

Boeing Airplane Co are establishing in Paris an office of international operations. In charge will be Mr N. D. Showalter, who has a long experience of engineering with Boeing. Chief project engineer on the B-17, he became chief of flight test, chief engineer at Wichita and, in 1957, vice-president and general manager at Wichita. The office address has yet to be notified.

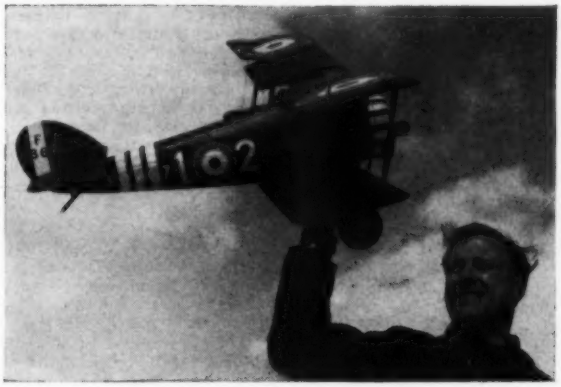
In the first of the Ultra anniversary lectures, Prof Arthur Porter, Dean of Engineering at the University of Saskatchewan, is speaking at the Royal Festival Hall in London on September 14 on *The Evolution of Instrumentation*. A limited number of tickets are available, on written application to the Public Relations Officer, Ultra Electric (Holdings) Ltd, Western Avenue, Acton, London W3.

The MoA, with the agreement of the Commonwealth Relations Office, have announced the appointment of Mr C. J. Francis as Counsellor (Defence Research and Supply), Ministry of Aviation, Canada, in succession to Mr F. S. Barton, CBE, who is retiring from the public service. Mr Francis became Assistant Director, Electronics Research and Development (Air), at the MoS in 1957, having previously been Superintendent, Electronics, at the British Joint Services Mission in Washington.

Mr C. R. Jeffs, underwriter and manager, Aviation & General Insurance Co Ltd, has been appointed a member of the board of the ARB, to fill the vacancy which arose through the death of Mr L. Murray Stewart. Mr Jeffs, who was a Fleet Air Arm pilot during the war and has held a commercial pilot's licence for 14 years, is an upper freeman of the Guild of Air Pilots and Air Navigators and a companion member of the RAeS.

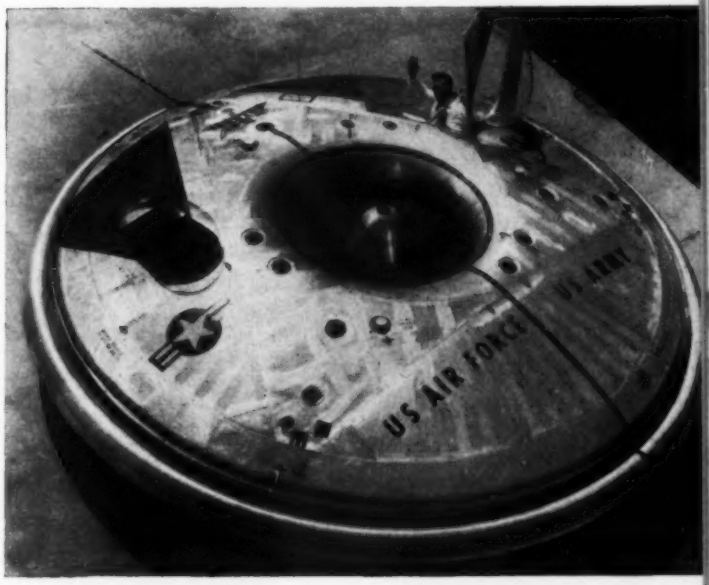
That the MATS heavy-cargo competition is far from settled is clear from the recent announcement by the US Air Force that it will buy "150 jet transports" each capable of flying the Atlantic with a 50,000lb freight load. A design competition has been authorized, and Boeing, Convair and Douglas are in the running with variants of their established jetliners. Lockheed have a jet version of the Super Hercules, but Canadair—who appeared to be a strong contender—seem to have been ruled out by the new insistence on jet propulsion.

***DOUBLING** across the deck, Royal Marines of 42 Commando race to board Whirlwinds of No 848 Sqn: a lively scene aboard HMS "Bulwark," the Royal Navy's first commando carrier, during recent exercises. The ship took military vehicles to Kenya last month*



***REALISM:** This splendid flying scale model of a Sopwith Snipe, the work of Mr John Simmance (president of Northwood, Middx, Model Aero Club) is powered by a 1.5 c.c. diesel and has autostabilizer control*

***AVROCAR:** A new picture of the Canadian Avro company's highly unorthodox vehicle, which combines the characteristics of a hovercraft (for take-off) and an aeroplane. The development programme has been financed by the USAF to the extent of $10m, and there are now rumours of £2m support by the Canadian Government*



BRISTOL SIDDELEY'S FANS

A New Generation of Gas Turbines

IN the aeronautical sphere, Bristol Siddeley's main development effort is devoted to the evolution of a new family of double-flow gas turbines which the company term "ducted-fan" engines. Bristol Siddeley Engines Ltd base their aviation effort at the large facilities at Patchway, north of Bristol, which were previously occupied by Bristol Aero-Engines Ltd. For the record, the company's rocket development is being done at the fine new plant at Ansty, near Coventry (see page 215), while all aircraft gas turbine engineering is concentrated at Patchway, though both factories are now engaged in aero-engine manufacture.

While the company is kept productive by substantial manufacture, service-support and development on such engines as the Olympus, Orpheus, Proteus, Sapphire and Viper, the strong design staff which has gradually been built up at Patchway under Dr S. G. Hooker, and recently strengthened by a number of engineers from Coventry, have been immersing themselves ever more deeply in the new field of turbofans. Rolls-Royce entered this field by progressively increasing the cold/hot ratio from the low values chosen in their early by-pass turbojets. Pratt & Whitney and General Electric were brought in by cunningly contrived, and competently engineered, modifications to existing turbojets in an urgent attempt to stay competitive. Bristol Siddeley were drawn to such configurations by a roundabout turn of development.

The story began when, early in 1957, Michel Wibault, the renowned French aircraft designer, proposed a powerplant scheme providing airflows which could be used for both propulsion and lift. The arrangement he suggested was novel, for he proposed that a gas turbine (the Bristol Orion turboprop) should be used to drive through shafting and bevel gearboxes to a quartet of centrifugal compressors turning about transverse axes and each provided with rotating outlet volutes which could each be turned around their associated impeller to direct the discharge in any desired direction. After studying his proposals the powerplant company decided that the arrangement would have excessive weight and was not an attractive one. Nevertheless, it set in motion a thread of development, aimed at producing an STOL or VTOL aeroplane of high performance, which has never ceased to gain momentum.

After preliminary investigations of a number of schemes, the engineers at Patchway planned a self-contained powerplant under the company designation of BE.52 which was at least relatively simple and rational and appreciably lighter than the original scheme. The essence of the BE.52 was that an Orpheus turbojet should be connected through a drive-shaft to the first three stages of an Olympus compressor positioned well ahead of the Orpheus intake. The Olympus compressor was arranged to handle an airflow entirely separate from that passing through the Orpheus; as the sketch shows, the Olympus discharge was ducted out through bifurcated trunks passing on either side of the turbojet.

Further study suggested that even this was by no means the optimum solution. As an installed powerplant the BE.52 would have been quite complicated and heavy, and could not have appealed to any ordinary aircraft constructor. Accordingly the same components were repackaged in juxtaposition, under the designation BS.53 (originally BE.53). In this engine the Olympus stages were mounted hard up against the Orpheus intake, and they were arranged to be driven by a separate shaft from a mechanically independent low-pressure turbine. Not only did this overcome the complex ducting problems of the BE.52, but it also supercharged the Orpheus and raised the overall pressure ratio of the compressor system very considerably. Both these improvements were highly significant, and they opened the way to a neat and compact powerplant of great versatility and wide appeal.

Obviously, by cropping the Olympus blades it would have been possible to have produced a very effective straight-jet successor to the Orpheus, but it was wisely decided to put all development effort into the ducted fan. During 1953 Sir Sydney Camm, director and chief engineer of Hawker Aircraft, was acquainted with the BS.53 and at once saw it as the basis of the propulsion system for a VTOL combat aircraft. His design team at Kingston were exploring the possibilities of producing a VTOL successor to the Hunter which would be likely to meet future tactical requirements of NATO. Under the company number of P.1127 Hawker Aircraft laid down a design programme for such an aeroplane, which is fast approaching completion. Bristol Siddeley Engines, then Bristol Aero-Engines, wrote the specification for the BS.53, although the external dressing of the powerplant was evolved in co-operation with Hawker. The basic design passed through a number of development stages, each having a quartet of outlet nozzles (two cold and two hot) which could in unison be rotated to give a resultant thrust axis at any angle between rearwards and downwards. The engine has for many months been financially supported from the Mutual Weapons Development Programme.

No data for the BS.53 may yet be published, but the company say "Its take-off thrust is exceptionally high in relation to its cruising thrust, and cruising specific fuel consumption is very low." A clue to its internal layout was given on p. 368 of our March 18 issue

Founder of a Family

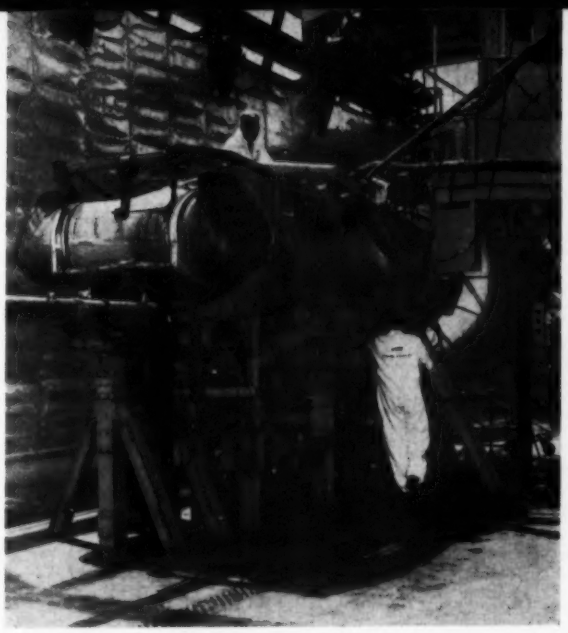
It is no exaggeration to claim that the BS.53 is the first of an entirely new family of aircraft powerplants, in which one set of exhaust jets may be used to provide a resultant force on the aircraft in any desired direction within a vertical plane through the nozzles, and thus generate lift, drag or propulsive thrust. All the installed thrust in the aircraft may thus be used to generate lift for vertical take-off, and there is practically no dead weight in flight. This also minimizes the total propulsive cost and the amount of maintenance required, and the fact that only one type of engine need be employed is an advantage from the viewpoints of training and logistics. All ground running can be done with the nozzles facing to the rear, thus reducing the problems of recirculation, debris ingestion and ground erosion, which are a major difficulty with fixed lift engines. Taxying the P.1127 will be perfectly conventional, and at take-off a short forward roll before the nozzles are turned downwards ensures that all debris is left behind. Moreover, since the propulsive mass flow is very great and the nozzle velocities low, the BS.53 will be only about half as noisy as a turbojet of the same thrust and will cause far less erosion on the ground. Yet another factor is that the P.1127 can always take off normally. Not only will this be an invaluable advantage in converting pilots to VTOL techniques, but it also means that from a normal runway the aircraft could carry a very great overload (thereby permitting the ferrying range to be considerable).

The accompanying photographs are the first to be released showing the new lift/thrust engine. A BS.53 first ran in August last year and a great deal of the basic testing has now been com-

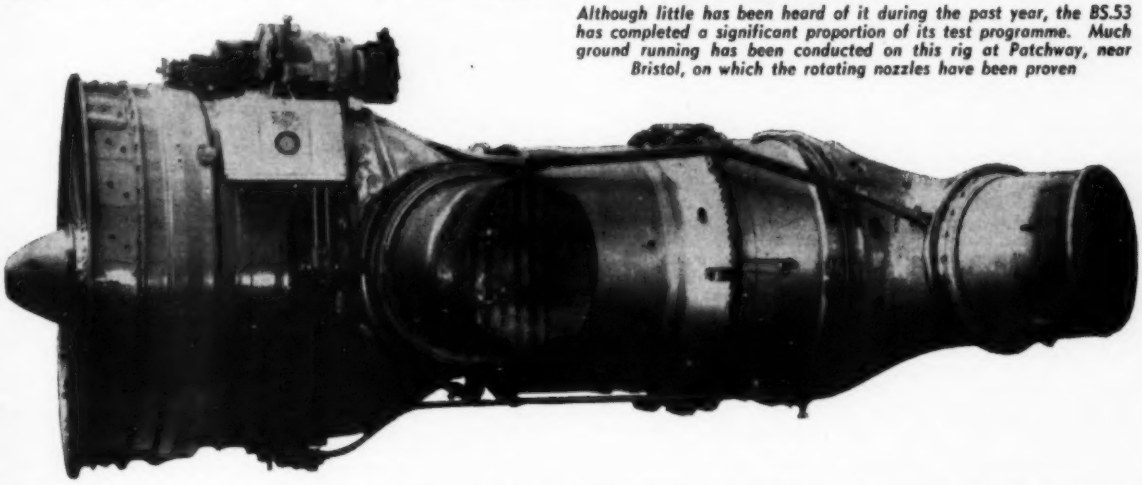
pleted. On the test rig at Patchway seen in one photograph the complete nozzle system has been developed until it is now completely reliable. In addition, a single nozzle has been subjected to endurance testing mounted on an Orpheus. Precise details of the nozzle system are classified, but it appears that each rotating unit is fabricated in Nimonic sheet and rotates on a number of rollers moving around a circular track. The picture on the right suggests that all four nozzles are chain-driven from an irreversible rotating-shaft system driven through gearboxes from a single actuator.

Many of the major portions of the BS.53—particularly the high-pressure compressor, the high-pressure turbine and the flame tubes—are based on well-known principles already proved in service. The fan and the high-pressure assembly are arranged to rotate in opposite directions, so that the resultant gyroscopic couple is very low. Provision must be made for bleeding air to control the aircraft in hovering flight, but details of this system are not apparent from the photographs. Bristol Siddeley make the point that the engine has been designed with both subsonic and supersonic applications in mind, and that it has also been used as the basis for a detailed study of a transport aeroplane capable of taking off conventionally with a very large payload and of STOL or VTOL operation with a normal payload.

Further discussion of the BS.53 is precluded, but its qualities are such that, even before the first was constructed, its designers realized that it would make an outstanding basis for further development. The most obvious form such development could take was merely to discard the four swivelling nozzles and carry



Although little has been heard of it during the past year, the BS.53 has completed a significant proportion of its test programme. Much ground running has been conducted on this rig at Patchway, near Bristol, on which the rotating nozzles have been proven

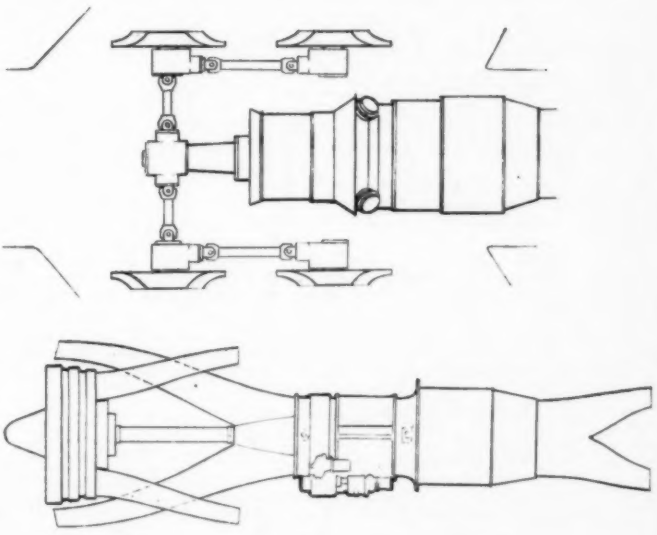


In side elevation the BS.53 appears a singularly clean powerplant. The related BS.58 weighs 2,600lb and has a sea-level thrust of 14,500lb

the fan discharge aft in a simple circumferential by-pass duct to form a cold propulsive jet concentric with the hot jet from the turbines. This was done under the project designation of BS.58, and a full scale mock-up of this engine was exhibited at the SBAC show last year. As we commented at the time, the mock-up had obviously been prepared from portions of BS.53, since the lateral bulges behind the fan could only have been intended to lead to lateral nozzles. Above the engine was mounted a neat accessory package including the Dowty fuel system components, Rotax pneumatic starter, twin alternators, Dowty hydraulic pump, fuel/oil heat exchanger and oil tank.

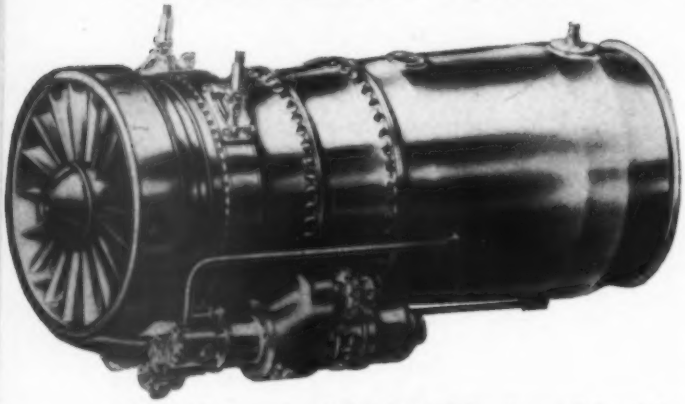
By this time the company had become Bristol Siddeley, and their technical sales staff discussed the BE.58 with potential customers. The latter took the view that the market for this type of powerplant was in danger of becoming overcrowded. Rolls-Royce, GE and Pratt & Whitney were already firmly established with engines in the same thrust class, and in addition the BS.58 could not really claim to be an "optimum" engine for the commercial market. Stemming as it did from a VTOL powerplant its design had from the start been biased in favour of light weight, and the pressure ratio was less than ideal for a civil transport.

During their survey of the potential market, Bristol Siddeley paid especial attention to the Hunting H.107. This project for a short-haul transport had originally started at Luton in 1957 as a 42,500lb aeroplane with a range of only 300 miles on two Orpheus turbojets. It was decided to investigate the effect of substituting a pair of scaled BS.58s—designated BS.61—of approximately Orpheus thrust. The revised aeroplane differed profoundly from the original straight-jet concept, since the range had been approximately doubled and the direct operating costs strikingly reduced. Similar studies were done on the Bristol 200/205 formula and it again seemed to Bristol Siddeley that they were near to



Above are two of the early projects which led to the BS.53; top is the original Wibault idea and below it is seen the BE.52 formula

BRISTOL SIDDELEY'S FANS . . .



This artist's impression of the BS.75 turbofan shows well its exterior dressing, three-point mounting and accessory package

having a very good engine. Going from one end of the scale to the other, the company conducted a brief skirmish with a very high-pressure engine of high by-pass ratio; designated BS.72, this unit appeared to be on the heavy side. What was wanted was something in-between.

The something in-between has now come to fruition as the BS.75. Whereas the 72 had been heavy and expensive, and had passed the point at which the law of diminishing returns combats further gains in economy, the 75 was carefully optimized from the start and represents a synthesis of all the best features arrived at in the investigations of earlier ducted fans. While it was being planned the Bristol Siddeley engineers took a long look at Hunting's design and agreed that the optimum aeroplane would be a 50,000lb machine with a pair of 7,350lb engines. This has led to a unit with a by-pass ratio of about 1.7, a fan flow of some 200lb/sec and a high-pressure mass flow (as a bare unit) of about 45lb/sec. The BS.75 promises to be an extraordinarily attractive powerplant, and is being actively studied by several airframe manufacturers.

It is too early to describe its design in detail. Nevertheless, it is instructive to examine some of the conflicting factors which have been taken into account in arriving at the chosen formula.

In any ducted fan or by-pass engine of this type—this terminology was briefly thrashed out in our issue of October 30 last—the designer is always faced with a problem in matching a low-flow turbine to a large-flow fan; yet it should be possible up to a by-pass ratio of about 2 to effect an efficient compromise with a fan tip speed not greater than that of existing turbojets. Even if this goal proves elusive, recent advances in the design of transonic blading have been considerable; most modern engines run at a tip speed between 1,000 and 1,250ft/sec and new designs do not start to run into serious problems until tip speeds are greater than 1,350ft/sec. Sharper and thinner blades are mandatory, and if the pitch angles are so chosen as to contain the shock system it is possible to maintain very high air speeds through the compressor without causing any fall-off in efficiency below the values now reached by all-subsonic assemblies.

Big fans are inclined to be distressingly noisy; but the 75 is not a large engine, and has a maximum tip speed entirely in accord with current practice and should not give rise to any acute intake-noise problem. Exhaust noise is known to be a function of jet velocity raised to the eighth power, and the BS.75 has a much lower jet velocity than a simple turbojet. The configuration is, of course, suitable for the installation of a simple reverser and silencer, both of which must always be regarded as a likely customer requirement.

Inspection suggests that the BS.75 will have a three-stage fan, leading to a likely high-pressure ratio of about 7 : 1 and an overall pressure-ratio about twice as great. One can also deduce that both the fan and the compressor are driven by independent two-stage turbines. The turbine assembly must therefore be similar in general mechanical design to that of the Proteus, and it is worth noting that the latter engine has now logged an enormous number of hours at overhaul periods of up to 2,400hr. It should be possible for the 75 to have a turbine-entry temperature no greater than that of the earlier turboprop (which has a take-off temperature of 1,190°K and uses Jessops G.64 cast turbine rotor blading).

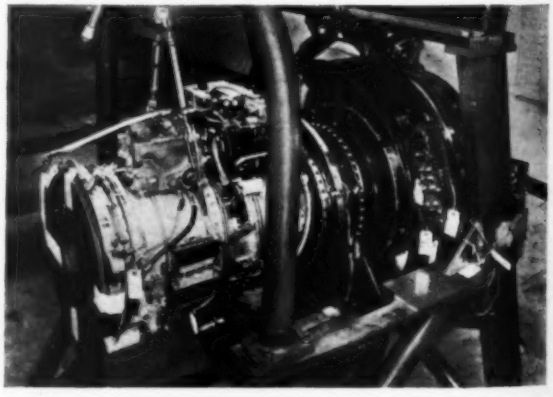
It may be possible to say a great deal more about Bristol Siddeley's new commercial ducted fans at the SBAC show next month. Already a vast amount of detailed studies have been made in an attempt to ensure that the BS.75 will truly be an optimum engine with the widest possible appeal to the manufacturers and operators of short-haul transports. We hope to discuss some of these studies in an early issue.

ENGINE NEWS FROM GE

THE US General Electric Co recently issued statements regarding new aircraft gas turbines and the further development of current models. From the aircraft gas turbine division at Evendale the company have shipped the first production CJ-805-23 aft-fan engines (16,000lb) for Convair 990 production. It is stated that development is in hand on the CJ-805-41 of 20,000lb thrust; offering "a modest improvement" in specific consumption, the -41 is designed to use major components of the existing engines and to be aimed at the cargo and short-haul market. The division have also received a $10m contract for the development of future J79 variants for the McDonnell F4H and North American A3J.

On July 29 the US Department of Defense released basic data on four of the most important current types of J79. Although the detailed figures for production marks of the commercial CJ-805 have long since been declassified, precise figures for the military J79 have until now been protected. The figures released are published in the table below.

The company's small aircraft engine department at Lynn announce the CJ-610 turbojet of 2,700lb guaranteed thrust (average 2,800) with s.f.c. of 0.97 (average 0.95) and weight of 355lb. Its aft-fan counterpart, the CF-700, has successfully completed its initial bench running and is scheduled for production delivery in February 1962 at $61,000 ($70,000 with reverser). McDonnell have selected the engine for their projected Model 220 executive transport. A T58 turboshaft unit (licence-built as the D.H. Gnome) has now successfully completed 2,000hr on the bench without overhaul. In co-operation with Kaman, a team from Lynn have developed a booster pod for helicopters; containing a J85 turbojet (2,600lb thrust), the 400lb pod would be capable of being quickly attached to the side of the helicopter and would "increase the craft's speed by 40 per cent, its lift by 20 per cent and its range by 17 per cent, as well as improve hovering and climbing properties."



Built with GE money, the first CF-700 (above) is now being bench-tested. Left, production J79s tabulated

Model	Application	Weight (lb)	Length (in)	Compressor inlet area (sq in)	Sea-level static ratings								
					Take-off (afterburner)			Military			75% of Normal		
					lb	s.f.c.	r.p.m.	lb	s.f.c.	r.p.m.	lb	s.f.c.	r.p.m.
-3A	Lockheed F-104A, B	3,255	207.45	652	14,800	2.04	7,460	9,600	0.87	7,460	6,710	0.825	6,960
-5B	Convair B-58A	3,635	202.17	654	15,600	2.08	7,460	10,000	0.84	7,460	7,270	0.78	6,900
-7	Lockheed F-104C, D	3,375	207.96	652	15,800	1.97	7,460	10,000	0.84	7,460	7,270	0.78	6,950
-2	McDonnell F4H-1 and NAA A3J-1	3,620	207.96	650	16,150	1.93	7,460	10,350	0.84	7,460	7,270	0.78	6,950

Missiles and Spaceflight

Reported on this page is the unsuccessful firing from Cape Canaveral on July 29 of Atlas 50D carrying a production Mercury capsule of the type which will be used for the first US manned sub-orbital launches later this year. The capsule is 6ft in base diameter and 9ft high; the 16ft tower carrying the capsule escape rockets was not fitted on this occasion. A research and development version of the capsule was Atlas-launched September last from Cape Canaveral; four similar models, two of which contained a monkey, have been flown during the past ten months, boosted by Little Joe rockets from Wallops Island

END-OF-TERM SPEECHMAKING

The subject of space research accounted for 62 minutes' talking time in the House of Commons on Friday, July 29, the day on which Members adjourned for the summer recess. As was only to be expected following the announcement by Mr Sandys on the previous Monday (reported and discussed in last week's issue), little was forthcoming by way of hard facts concerning a possible large-scale British space programme, but Mr Geoffrey Rippon had a few incidental facts to give by way of amplification.

The debate was opened by Mr Geoffrey de Freitas, who recalled raising the subject of space research in an adjournment debate in April 1959, since when, he suggested, the Government had shown little sign of recognition that we were living in the second half of the twentieth century which, whether we liked it or not, was a space age. "My concern today," he said, "is that the money sunk in Blue Streak shall not be wasted but shall be used instead as the basis of a British space programme."

The contribution made by Vice-Admiral John Hughes Hallett to the debate was hardly notable as a deep-thinking analysis, but it contained this novel suggestion: "My general conclusion is that we should be wise . . . to let other nations do a good deal of the pioneer work, watch it carefully and then try and cash in when there is something to be made out of it."

Mr Desmond Donnelly, who supported Mr de Freitas in urging the Government to go ahead with a large-scale programme, asked a relevant question: "I should like to know from the Parliamentary Secretary the Government's view about the specialist report which they had prepared for them by Sir Edward Bullard and Sir Harrie Massey. As the House may know, that specialist report, by two very distinguished Fellows of the Royal Society, recommends the granting to such research of a priority similar to that given to atomic energy, and that is a very high priority indeed."

Replying to the debate, Mr Rippon, Parliamentary Secretary to the Ministry of Aviation, assured the House that the only factor which was causing delay in the Government's decision was the need to consider all the implications. "There is no one objective which clearly justifies an affirmative decision," he said, "and no formula through which we can derive a coldly logical conclusion. Space research is a most challenging proposition to many hon. Members, but it is also true that the Government would be open to charges of irresponsibility if they undertook a programme of this magnitude without considering and most deeply pondering all its aspects."

Design studies had shown that at least three types of satellite could be launched by a vehicle using Blue Streak, a modified Black Knight and "a new third stage based on an existing motor." "For example, we could launch a satellite which could carry a payload of between 1,500 and 2,000lb in a circular orbit at a height of 300 miles. This satellite may be stabilized relative to the stars, and would be suitable for astronomical observation.

"The second type of satellite could carry a payload of between 300 and 500lb in an orbit of a maximum height of between 8,000 and 12,000 miles, and this type of satellite would be used for observations of the Earth's atmosphere. The third type could carry a payload of 50-100lb in an orbit with a maximum of about 100,000 miles for investigation of the properties of space beyond the Earth's influence."

After considering the potential benefits of a major space programme, Mr Rippon turned to the question of costs. "Considered in isolation, the cost of such a programme may be considered not excessive in relation to the total gross national product over a decade, which must be at least £20,000 million and ought to be considerably more; but we cannot consider this in isolation.

"We have considerable commitments at home in the spheres, for example, of education and medical research. We have great responsibilities abroad, which necessitate a high level of defence expenditure. We are also providing about £100m of public money in aid of undeveloped countries, apart from the services we provide, and last year we invested about £300m in private money across the exchanges. All these factors must be weighed carefully."

K. T. O.

MERCURY ATLAS FAILS

The first Atlas-boosted flight of the production version of the Project Mercury capsule was made from Cape Canaveral on July 29, ending in failure with an explosion in the Atlas 65sec after lift-off. A 1,500-mile flight down the Atlantic Missile Range had been planned.

The objective of the Mercury aspect of the firing was to test the abort-sensing and implementation system. In an operational Mercury launch, any significant variation in booster performance would be sensed and signalled to the capsule escape system which would separate the capsule from the booster. Although the capsule's escape tower was not fitted for the July 29 launch, it was reported that the abort-sensing system functioned correctly.

Other capsule items which were omitted on this occasion were the environmental-control system, astronaut couch, and stabilization and control jets. The Mercury capsule test was being made on a "piggy-back" basis aboard a research and development flight test of the Atlas weapon system. The Atlas was numbered 50D and the capsule was designated MA-1.

Missiles and Spaceflight . . .

On August 2 a B-52 successfully fired a GAM-77 Hound Dog down the Atlantic Missile Range. The weapon "hit its target 500 miles downrange with extreme accuracy."

Several solid-propellant engines for the USAF Minuteman ICBM have been successfully fired at Tullahoma in simulated space conditions. This is the first time that an engine of this size and character has been statically fired in a space environment.

On July 30 the US Secretary of Defense called a meeting of 56 ICBM contractors at which he exhorted them to "tighten up" their operations. Labour disputes have already put the deployment of the Atlas behind schedule, and recovering the lost time will take "the rest of this year and possibly longer."

It was noted on this page on June 24 that the first of the "operational prototype" Titan ICBMs had then just been delivered to Cape Canaveral. Known as the J-series, the first two of these ICBMs have been only partially successful. The first had to be destroyed shortly after leaving the pad on July 1, and the second suffered premature first-stage shutdown and fell in the sea about 50 miles offshore.

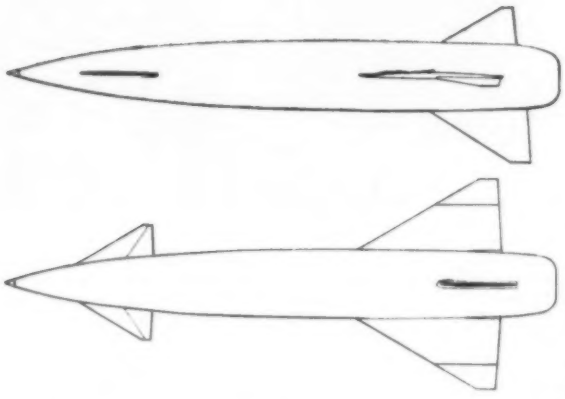
Flight testing of Nike Zeus is making telemetry demands which cannot be met by existing systems, say the Leach Corp, who have developed a new instrumentation system to record wide-band h.f. data. The equipment has been built around a magnetic-tape recorder housed in a recoverable aluminium case carried in the nose of the missile. The device incorporates precise timing oscillators and a frequency reference.

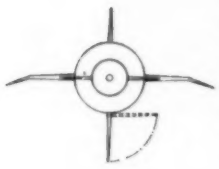
According to Dr Richard Mose, director of US Army Research and Development, Atlas ICBMs fired from Vandenberg will next year be used as targets for the Nike Zeus system "which can distinguish between dummy warheads and those armed with nuclear weapons." The Zeus emplacements are now being constructed at Kwajalein Island in the Pacific, and other Zeus teams are at present based on Ascension Island at the end of the Atlantic Missile Range.

It was announced by Bristol Siddeley Engines on August 2 that the BSRJ.824 is a new ramjet intended for operation at high altitude and high supersonic speeds. The BSRJ.824 has been fully evaluated in the company's high-altitude test plant at Patchway, with very satisfactory results. One of these new engines, with a diameter of 18in and a length of 99.6in, will be on Bristol Siddeley's stand at Farnborough next month.

The National Aeronautics and Space Administration has selected Lockheed Aircraft Corp and the Martin Co with whom to negotiate six-month study contracts on the requirements of a nuclear rocket flight-test programme. The scope of each of the $100,000 studies will include system preliminary design, development programming, planning of test and tracking facilities, schedules and safety factors. Lockheed will be assisted by the Rocketdyne division of North American Aviation.

BLUE STEEL AND ITS ENGINE





Dimensions of the Avro Blue Steel Mk 1 include: overall length, 35ft; foreplane span, 6ft 6in; wing span, 13ft; distance from fuselage to start of anhedral, 4ft 10in; fuselage diameter, 4ft 2in; distance from fuselage axis to fin tips, 4ft 6in (upper) and 5ft 4in (lower, extended)

IT is now possible to publish a makers' three-view drawing of the Blue Steel Mk 1 stand-off bomb, and to describe and illustrate its powerplant—the Bristol Siddeley Stentor. Together these facts enable a much more accurate assessment of this important contribution to our deterrent to be made.

Recapitulating briefly upon what has already been published in these pages, the Blue Steel is a winged, rocket-propelled, fully guided, supersonic-cruise vehicle which can be carried by a V-bomber and launched at a considerable distance—probably at least 100 miles—from its target. During the outward flight the navigation systems of the parent aircraft are tied in to the Elliotts inertial system of the Blue Steel, but from the moment of separation the latter is completely self-contained, and can fly along any previously chosen flight path or altitude profile to its target while the parent bomber returns to base. Blue Steel is obviously intended to carry a thermonuclear warhead with a megaton yield.

Prime contract for its development was placed with the Weapons Research Division of A. V. Roe & Co Ltd, at Woodford. During the past three years a vast amount of work has been done by this division in developing the basic Blue Steel Mk 1 and preparing the way for future developments. An outline of the early part of the flight-test programme was published in our issue of March 11, wherein it was noted that up to that time there had been numerous launchings of small-scale models to prove the basic aerodynamics, control and elements of the guidance and propulsion systems, and of full-scale vehicles powered by de Havilland Double Spectre engines which superficially resemble the operational weapon. These test vehicles were originally launched from the RAE Aberporth (with partially filled tanks to keep the vehicle within the limited confines of the Cardigan Bay range) and are now being flown as fully "hot" rounds from Valiants and Vulcan B.1s at the WRE Woomera (with full tanks).

Originally there was to have been a Blue Steel Mk 2, but this completely redesigned vehicle would not have been in service with RAF Bomber Command for several years, and in the view of the Ministry of Defence would have been unduly vulnerable by the time it went into service. Little has been said about it, but some reports suggest that it would have been propelled by ramjets in order to achieve a substantially increased range. Nevertheless, it would be ridiculous if nothing was done to "stretch" the existing Blue Steel Mk 1 and wring out of it all that can quickly and relatively cheaply be obtained in the way of improved performance. This is now to be done, and unofficial reports state that the improved missile will be known as the Mk 1★.

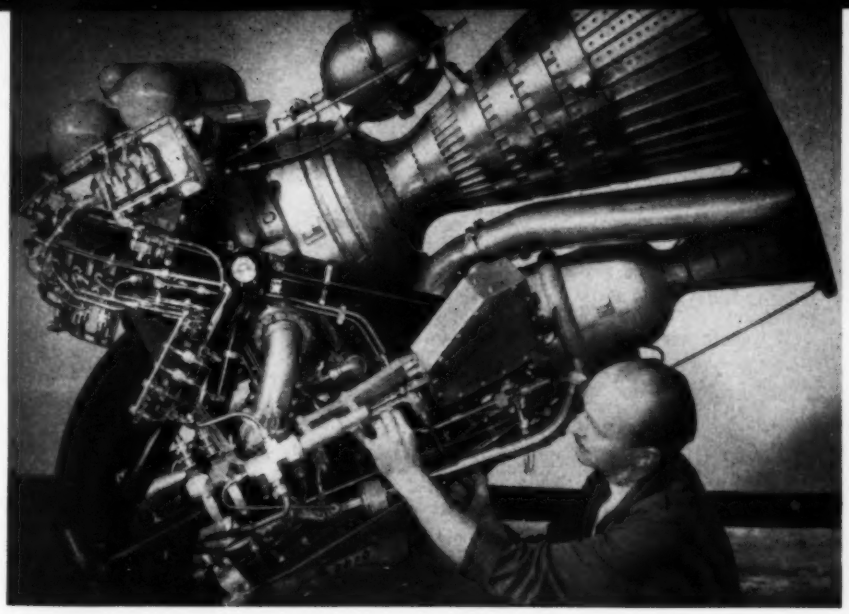
All Blue Steels are intended to be compatible with both the Vulcan B.2 and with the limited number of Victor B.2s currently on order (see page 208). As the new general-arrangement drawing confirms, the Mk 1 missile has a folding ventral fin, which extends after the parent aircraft has taken off. The outboard panels of the wing are tilted downwards in order that the weapon shall not foul any part of the parent aircraft; the limiting factor appears to be the flaps of the Victor B.2, which are swept down to pass under the jetpipes of the engines. After release the missile falls freely for a few seconds; then the engine lights up and the Blue Steel accelerates ahead, climbs, and runs home at high supersonic speed. Its radar cross-section is certainly much less than that of a V-bomber, and it retains all the capability of a manned aeroplane to feint, manœuvre and change its flight profile in any desired manner.

Propulsion in the Blue Steel Mk 1 is provided by the Bristol Siddeley Stentor ASSt.1-1, illustrated (p. 215) for the first time. Like the Snarler, Screamer and Gamma—all pump-fed liquid-propellant rocket engines developed to a high degree of reliability—the Stentor has been developed at what is today Bristol Siddeley's Power Division, at Ansty, Coventry. The Ansty rocket design team, directed by Sidney Allen, chief engineer of the Power Division, is now one of the most experienced in the world in the field of complete rocket engine packages for supersonic propulsion, and they were the first to develop a fully controllable engine for aircraft use. The latter, the Screamer, used liquid oxygen, but all their most recent units have employed high-test peroxide as oxidant.

Few details of the Stentor may be published, but it can be stated that this engine operates on HTP and kerosine. It has two chambers, both rigidly fixed to the airframe, one having roughly four times the thrust of the other (perhaps 16,000lb and 4,000lb at sea level would not be wildly out as guesses at the sea-level ratings of the two chambers). During the starting cycle HTP is expelled from a starting tank by nitrogen pressure and is decomposed in a catalytic steam generator to supply superheated steam to drive the main turbopumps. When the latter have run up to an adequate speed—at something less than the full operating speed, and perhaps reached in less than a second—the turbine is fed by the delivery from the HTP pump, and the starting system is cut out of circuit.

HTP from the turbopump unit is fed through numerous axial passages formed in the wall of both chambers, according to a

Missiles and Spaceflight . . .



Only this one photograph of the Bristol Siddeley Stentor rocket engine has been released for publication. The lower chamber appears to be essentially a scaled version of the larger upper chamber, and the latter shows well the company's patented method of construction. Between the two may be discerned the turbopump exhaust pipe, and above the engine is the HTP starting tank. In the photograph the engine is mounted on a rotating erection stand

Bristol Siddeley patented technique, and thus acts as a coolant. The fluid passes down to the end of the divergent expansion nozzle and then back along another series of passages to the head of the chamber. There it passes through a catalyst pack and decomposes into a mixture of oxygen and superheated steam. Kerosine is then injected into the chamber and burns in the excess oxygen to increase the chamber temperature, pressure, jet velocity and specific impulse. Before and after each run the fuel injectors are purged by nitrogen, and the technique used with such success during the development of the Gamma of drying out the HTP circuits with hot air after each test run has again been adopted.

Today the Stentor ASSt.1-1 is in quantity production at the Ansty plant, and it is fair to claim that it has already shown itself to be a unit of exceptional reliability and promise. In the Blue Steel it should not be called upon to operate for more than ten minutes or a quarter of an hour, but the engine is undoubtedly potentially capable of much more prolonged operation and should prove a sound basis for further development.

NORD C.T.41

THE firm of Nord-Aviation (2 à 18, Rue Béranger, Chatillon-s/s-Bagneux, Seine) have now been able to release further details of the C.T.41 supersonic target. Drawing upon their great experience obtained with the development and production of the C.T.10 and C.T.20, Nord embarked upon the C.T.41 in 1957; No 01 was fired early last year and test vehicle No 03 was exhibited at the 1959 Paris Salon. During the early flight trials structural failure resulted from aeroelastic instability, but recent tests have been entirely satisfactory.

The C.T.41 has a circular-section fuselage of extreme fineness ratio, which houses (front to rear): a powered foreplane; storage battery and radio control unit in a heat-insulated compartment; nose-section recovery parachute; Doppler miss-distance indicators; transponders and other equipment (provision will be made for X- and S-band transponders, Luneberg lenses, infra-red flares and, eventually, travelling-wave transponders); centre-section recovery parachute; five flexible fuel cells; braking parachute; and the fixed vertical fin, symmetrical above and below the aircraft, in which are housed the control receiver and tracking transponder aerials. Through the centre section passes the torsion box of the double-convex wing, to the tips of which are attached the Nord ramjets, each of which contains a centrebody housing the turbopumps, fuel-control and Mach-limiting unit. Apart from highly stressed attachments, which are of steel, the airframe is of AU4G or AU5GT light alloy, and it can be dismantled into five elements for shipment.

Ground equipment includes a variable-elevation, zero-length launching ramp fabricated from steel tubing, and a launching and ramp control unit with a refrigerator to cool the radio up to the moment of firing. The boost unit consists of two solid motors (the present pattern has a nose with the form of a vertical knife-edge) tied together by twin aerofoil surfaces. Flight stabilization is provided by an autopilot, which governs roll and pitch (by spoilers outboard of the engines) from vertical and rate gyros, directional control from a turn gyro and altitude from a capsule. Tracking data are at present fed from a DSH airborne transponder interrogated from Type IV ground equipment, although radar tracking can be employed. When the "recovery" signal is given the engines are shut down, the rear section and fin blown off and the braking parachute deployed. At the appropriate speed and altitude the nose section is jettisoned and its parachute streamed. This makes the centre section unstable; it pitches through 180° and places the body in a suitable attitude for the release of the main parachute.

On November 16 Nord signed a licence with Hawker Siddeley, under the terms of which the British company may manufacture the C.T.41, and maintain and support French-built C.T.41s in the British Commonwealth. On March 21 Bell Aircraft announced a similar agreement, giving the American firm manufacturing rights and also engineering assistance in related supersonic ramjet vehicles.

NORD C.T.41 DATA

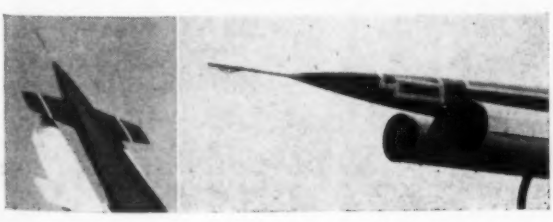
Canard target powered by two 24.6in ramjets and boosted by two solid motors.

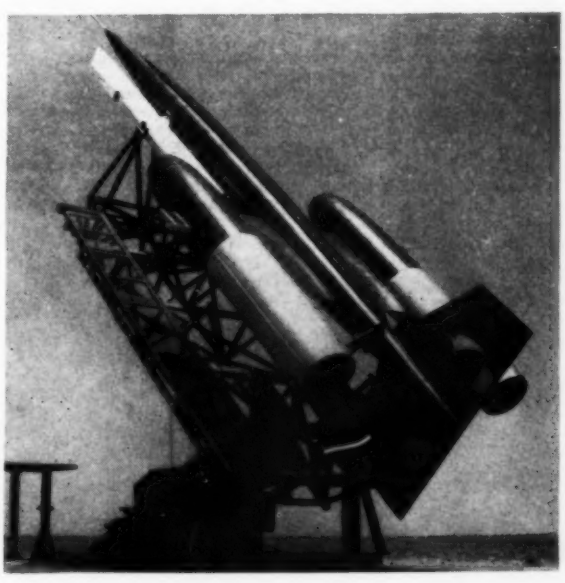
Dimensions Overall length, 32ft 2in; wingspan, 5ft 10in to tips of wings or 11ft 11in to tips of control surfaces outboard of engines; wing area, 33.26 sq ft; max fuselage diam, 20in.

Weights Target, zero-fuel, 1,765lb; fuelled target, 2,865lb; boost-motors, 1,765lb; boost cradle, 990lb; launch weight, 5,620lb.

Performance Boost burning time, 7sec; Mach number at boost burnout, 1.6; max axial acceleration during launch, 10g; times to reach cruising speed of M2 at various heights, 80sec to 65,000ft, 55sec to 52,500ft or 35sec to 40,000ft; endurances, cruising at M2, 14min at 65,000ft, 10min at 52,500ft or 6min at 40,000ft; normal cruising Mach number, between 1.5 and 2.5.

The fourth Nord CT.41 is seen at right on its launcher. Below, left, is the front end (with foreplane) of the third round, while the other small picture shows the first, which had flat-nose boost motors





Among the open-class aircraft at the championships were (from the top) the American RHJ-6, West German Phönix and Swiss Elfe M

SAILPLANES AT BUTZWEILER

ILLUSTRATED WITH "FLIGHT" PHOTOGRAPHS

THE most interesting machines seen among the crop of sailplanes at this year's World Gliding Championships at Butzweiler Airfield, Cologne, were reviewed last month by Frank Irving, MEng, DIC, AFRAeS, in a talk at the Kronfeld Club, London. The main facts and comments presented on this occasion by Mr Irving, who is chairman of the British Gliding Association's technical committee, have formed the basis for the following type-by-type notes, which begin with the open-class aircraft.

RHJ-6 (USA). Designed and built by Richard Johnson with no concessions to "styling," this aircraft was designed as a two-seater, but was flown with a solo cockpit at Butzweiler. Unlike the RJ-5 (wooden fuselage, metal wings) the RHJ-6 has a conventional all-wood structure—and a pretty solid structure at that, with ribs and frames cut from gaboon ply. No less than 60lb of lead ballast was needed in the nose to get the c.g. right. The rudder appeared to be too small, and probably was.

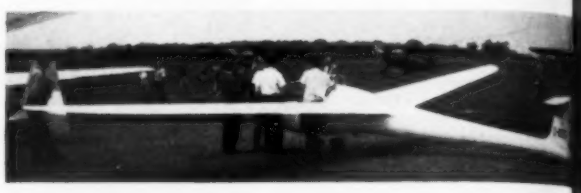
An Eppler wing section is used, designed to keep the boundary layer laminar as far back as possible and then to give low skin-friction under the turbulent boundary layer by operating close to separation. This is not necessarily a good philosophy, since viscous losses in the boundary layer will somehow appear as drag—presumably form drag. But wind-tunnel tests showed slightly lower drag and wider bucket than a corresponding NACA section. During the championships Johnson suspected some premature separation at low speeds, and attached a full-span line of triangular cardboard vortex generators (results not known).

A tee-tail is obviously useful for crop clearance on landing. The RHJ-6 tail is very heavily built, but it is not clear how much of the weight is due to asymmetric stressing cases. The slight dihedral obviously complicates the elevator linkage.

Phönix (W. Germany). The tee-tail and Eppler wing-section are the only features which this aircraft has in common with the RHJ-6. Elegant in shape, the German machine looks as if it were designed by someone more accustomed to model gliders, since little regard seems to have been paid to such items as adequate controls. Its span is only 16 metres—extremely small for an open-class aircraft. The structure employs a glass-fibre/balsa/glass-fibre sandwich, with glass said to be only 0.1mm thick and hence easily bruised. The fuselage bottom was frequently bruised in field landings during the championships, due to excessive deflection of the wheel, which pivots backwards for springing and still further back to retract.

The wing finish is superb. Tests by Gus Raspet showed slight turbulent separation at high C_L, but this did not seem to worry Haase as much as it did Johnson. According to Haase, the ailerons were pathetically weak; hence the anti-servo tab on the rudder "to get round corners somehow." The tab is intended primarily to increase rudder effectiveness, not to increase hinge moment.

The cut-out in the elevator to clear the rudder looks untidy, and not really necessary if the rudder shape were only slightly altered. Airbrakes consist of flaps slightly forward of the trailing edge of the wing lowered to 90° to act as brakes. This was not very effective near the ground and, as it presumably increases C_L as well as C_D, it is not a good idea in general. The cockpit and canopy of the Phönix were very neat. No special instruments were fitted.

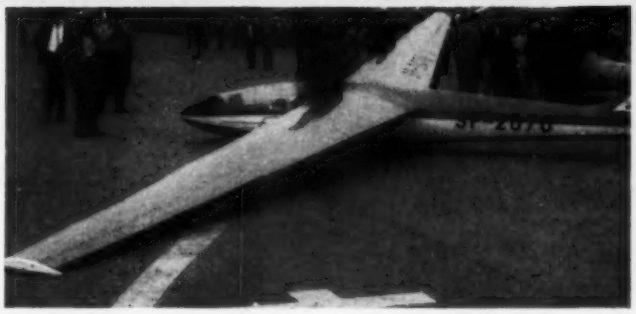


Meteor 60 (Jugoslavia). This machine still looks very exotic but less startling than the Polish newcomers. It is all-metal, 20 metres in span, very complicated and very expensive. The aircraft is basically the same as the earlier Meteor 57, but with a cleaned-up centre-section/fuselage junction, involving the widening of canopy at rear and fuselage shoulder. The Meteor has a very slender fuselage, but the attitude of the pilot is not extreme. The aircraft has been tested both with and without the wingtip "shapes"; according to Boris Cijan a better low-speed performance was obtained with shapes fitted.

Zefir 2 (Poland). This and the standard-class Foka were the two most interesting aircraft at the championships, and their most impressive feature was their extreme slimness. The Zefir employs a straightforward wooden structure in a very slender fuselage, attained by (a) a fairly flat seating attitude for the pilot—but not as extreme as one might imagine—plus (b) the elimination of control-runs under the seat. The pilot's posterior is only an inch or two from the bottom of the fuselage.

This is achieved by unscrambling stick movements at the base of the stick to work a push-pull rod for elevator and torque tube for ailerons, running along the fuselage sides under convenient

Most of the open-class limelight was focussed on the Polish Zefir 2 sailplanes, one of which is seen in the lower left photograph. Detail points of interest include the semi-reclining pilot position (below right), and the wingtip-mounted thermal detectors (right) which were fitted on several occasions



Outstanding in the standard class were the Polish Foka (upper photograph) which attained consistently high daily placings, and the Standard Austria, this year's winner of the OSTIV prize

armrests. These side-rests also accommodate minor controls.

The aircraft carries no airbrakes in the wing, but depends instead on a "one-shot" parachute which can be extended or jettisoned. This seems satisfactory for Polish potato-fields, marginal for German beetroot-fields, and probably pretty useless for English cabbage-patches.

The cockpit canopy did not appear to be very clever—the angle of sight is too flat for good visibility, and an optical flat is moulded in to improve the situation. The cover slides forward about 3in and hinges up at the front. Space for instruments, which are fitted in a pedestal between the pilots' shins, seems rather restricted. Two rather curious instruments were observed; one was either an artificial horizon working only in roll or (more probably) a turn-and-slip with presentation turned through 90°; the other was a thermal-detector ammeter. The thermal detector, employing a removable element at each wingtip, was said to measure the temperature gradient across the span.

The swept fin and rudder represented basically good modern styling, with the aft location of the tailplane giving a long moment-arm in addition. The sweep also increases the moment arm of the fin and rudder. Rather a gimmick, but an elegant one.

The wing has a long, parallel centre-section with flaps, and short, tapered outer panels with ailerons. Rigging appeared to be fairly easy, but was usually carried out rather gently. The claimed L/D from flight tests was 35.

Elfe M (Switzerland). First seen in 1956 at St. Yan, the Elfe was possibly responsible for starting the swept-fin fashion, but now looks less elegant when compared with the 1960 Polish aircraft. The wing now seems less inclined to extreme deflections than at St. Yan.

STANDARD CLASS

Foka (Poland). Superficially similar to the Zefir, although designed by a different man. It has been suggested that the similarity is partly due to the standardizing effect of the Polish design system. The Poles believe the Foka to be a more mature design than Zefir, and claim an L/D ratio of 34 for the standard-class machine.

To comply with the standard-class rules the aircraft has a wheel, skid and conventional airbrakes. The wheel is well aft and the sailplane sits on its skid even when unladen. The Foka really behaves like a skidded aircraft with the wheel available for ground-handling.

The straight-tapered wing looks more elegant than that of the Zefir. The cockpit cover slides forward. One of the two specimens at Butzweiler had an all-moulded Perspex canopy with practically no forward visibility at all. The other example, the one flown in the championships, used a bent conical sheet for the forward section—a great improvement. The cockpit layout was similar to that of the Zefir. Both machines had small ground incidence, but this seemed acceptable with the use of powerful tug aircraft. In-flight handling characteristics were reported by British pilots to be good.

Standard Austria (Austria). This sailplane was the winner of the OSTIV prize. It has an elegant fuselage (but small ground-clearance) and an all-moving vee-tail similar to that of the K-1. Its spinning behaviour is not known. The wing is a rather complicated structure in wood. The cockpit is well-finished with a neat canopy which avoids extremely flat angles. Rigging qualities were excellent and the wing-fuselage intersection was good.

Fauvette (France). Rather similar in theme to the Austria, but using a sandwich structure, the Fauvette does not seem to have achieved its anticipated popularity, perhaps because the performance it not as good as hoped. The vee-tail has separate moving surfaces. Main merit of the design is its simplicity and lightness, resulting in extremely easy ground-handling.

Ka-6 (W. Germany). OSTIV prize-winner in 1958, this type is now very popular. It is a good, straightforward aircraft with no particularly unconventional features. Its main merits are good controls (particularly ailerons), good low-speed performance and excellent rigging. The snags appear to be a lack of fore-and-aft stability, and a peculiar bed-spring attached to the stick for trimming. Two examples at Butzweiler had all-moving tails. It was not clear how stick-free stability was provided.

Schweizer 1-23H (USA). A conventional Schweizer 1-23G, cropped to 15 metres and fitted with speed-limiting brakes (which seemed amateurish in design) instead of spoilers. Of all-metal construction, the 1-23 is a good "cooking" glider which generally worked well. Forward visibility is poor, however, due to the high front fuselage.

CONCLUSIONS

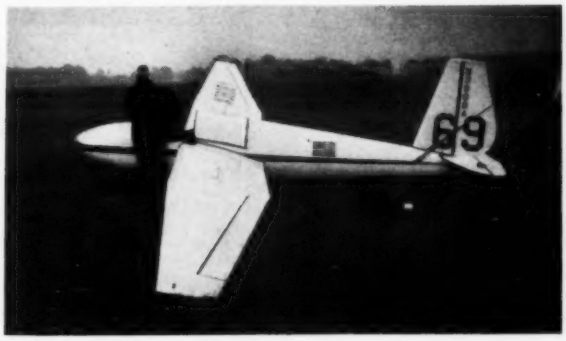
1. Fuselages are becoming more slender to reduce their drag. This is mostly done by eliminating deep bilges and partly by reclining the pilot somewhat (but not necessarily very much). English gliders tend to look like double-decker buses in comparison. Nicholas Goodhart had some four inches of headroom to spare in the Olympia 419. There seems no reason why we in this country should not make slimmer fuselages, even with little alteration to the seating.

2. There is an increasing tendency to use long cockpit-covers giving bad forward visibility. English sailplanes look rather too blunt and bulbous although their visibility is excellent. A compromise seems indicated.

3. Cockpit interiors in foreign sailplanes are generally much better in finish than the British ones. A spray of cockpit green and some cheap moquette on the cushion is really no longer adequate.

4. Many of the foreign aircraft seemed to have smaller tailplanes than ours. A small tail will give reduced profile drag—but the c.g. is further forward to give adequate static margins, and hence there is an increased down-load on tail in most conditions of flight, i.e. more tail-induced drag (and slightly more wing-induced drag). Some calculations on a typical standard-class glider indicate that these effects (dragwise) largely cancel out, and tail size has very little effect on performance. The optimum tail volume coefficient, on this basis, appears to be about 0.5, but the loss in max L/D in going to 0.7 (about Skylark value) is only one per cent.

Left, the West German Schleicher Ka-6 achieved five out of the first six standard-class places. Right, the American Schweizer 1-23H



One of the three regional sites for this year's National Soaring Week competitions was Edge Hill Aerodrome, near Banbury, where the meeting was organized by Coventry Gliding Club

BAD WEATHER AFFECTS SOARING AT ODIHAM, DUNSTABLE, EDGE HILL, AND SUTTON BANK

Service and Civil Gliding Contests

FIVE competitive gliding meetings at four sites took place in the fortnight ending with the August Bank Holiday weekend. These were the RAF Inter-Command Championship (July 16-23) and the Inter-Services Championship (July 24-31) at Odiham; and regional National Soaring Weeks (July 23-August 1) at Dunstable, Edge Hill and Sutton Bank.

The weather in general was not good during the contest period, although the holiday weekend produced strong conditions. Notes on the flying and results at each site are given below.

RAF Inter-Command Championship, Odiham. July 16, distance along dogleg track Odiham - Benson - Ely, line continuing to coast at West Runton. Equal first, John Williamson (Olympia 419) and G. A. Coatesworth (Olympia 401), 163 miles to West Runton; third C. P. Jeffery (Olympia 2b). Roger Mann, flying *hors concours* in a Skylark 3, also reached West Runton.

July 17, no contest. July 18, goal race Lasham - Shoreham, no contest. July 19, goal race Lasham - Shoreham, no contest. July 20, free distance. (1) John Williamson, 121 miles to Crediton; (2) Andy Gough (Skylark 3b), (3) A. Loveland (Olympia 2b). July 21, goal race Lasham - Shoreham, marked as fixed-line distance as no pilot reached Shoreham. (1) J. G. Croshaw (Skylark 3b), (2) G. A. Coatesworth, (3) N. W. Kearon (Skylark 3b). July 22, free distance. (1) F. D. Cretney (Skylark 3b), (2) J. G. Croshaw, (3) John Williamson.

Final results: Individual; (1) John Williamson, 296.5 points; (2) J. G. Croshaw, 266; (3) F. D. Cretney, 196.5; (4) G. A. Coatesworth, 185.5; (5) A. Gough, 157.5; (6) N. W. Kearon, 146.5; (7) A. Loveland, 133.5; (8) G. R. Barrell, 98.5; (equal 9) J. D. Spottiswood and C. P. Jeffery, 98; (11) E. T. Ware, 86.5; (12) R. Dunn, 84.

Command placings: (1) RAF Germany, (2) Technical Training, (3) Maintenance, (4) Bomber, (5) Flying Training, (6) Fighter and (7) Transport. The RAF team going forward to the inter-Service contest comprised the first seven in the individual list, plus R. Dunn in the new Olympia 460.

Inter-Service Championship, Odiham. July 24, no contest. July 25, distance along dogleg track Lasham/Firle Beacon/Deal Castle. Equal first, F. D. Cretney, J. Williamson, E. Stark (Army, Skylark 3f) and E. G. Shephard (Army, Olympia 419) (also David Ince, *hors concours*). July 26, no contest. July 27, free distance. (1) J. Williamson, (2) A. Gough, (3) A. Loveland. July 28, no contest. July 29, goal race Bicester - Yarmouth, marked as set-line distance. (1) A. Gough, (2) J. G. Croshaw, (3) G. A. J. Goodhart (Royal Navy, Skylark 2). July 30, distance along line Lasham - Benson. (1) Sir Charles Dorman (Army, Skylark 3b), (2) N. W. Kearon, (3) F. D. Cretney.

Final results: Individual; (1) E. G. Shephard, Army, 273 points; (2) F. D. Cretney, RAF, 269; (3) N. W. Kearon, RAF, 225; (4) J. Williamson, RAF, 215.5. Team; (1) RAF, 709.5 points; (2) Army, 519; (3) Royal Navy, 121.

National Soaring Week, London Gliding Club, Dunstable. July 23, free distance, no contest. July 24, free distance. (1) D. A. Smith, 110 miles to Yarmouth, (2) C. Ellis, (3) M. Kaye. July 25, 100km triangle Dunstable/Steeple Morden/Podington, marked as set-line distance. (1) P. Scott, (2) M. Kaye, (3) R. Mann. July 26, distance along line through North Denes. (1) M. Kaye, 111 miles to Caister beach, (2) P. Ramsden, (3) R. Procter. July 27, rest day. July 28, no contest day. July 29, race to Swanton Morley, 87.5 miles, marked as set-line distance. (1) P. Scott, 56 miles, (2) J. Jeffrey, (3) G. Burton. July 30, out-and-return race to Desborough, 86 miles, no contest. July 31, out-and-return race to Peterborough, 102 miles. (1) P. Scott, 36.9 m.p.h., (2) G. Burton, (3) G. Stephenson. August 1, free distance. (1) R. Mann, 195 miles to Darlington, (2) P. Scott, (3) G. Burton.

Final results: (1) P. Scott, Olympia 419, 489.8 points; (2) G. Burton, Skylark 3, 445.4; (3) M. Kaye, Eagle, 438.6; (4) D. A. Smith, Skylark 3, 421.6; (5) R. Mann, Skylark 3, 421.1; (6) C. Ellis, Skylark 3, 404; (7) C. Bentson, Skylark 3, 395; (8) G. Stephenson, Skylark 3, 330.1. Total entries, 22.

National Soaring Week, Coventry Gliding Club, Edge Hill.

Final results: (1) L. R. Redshaw, Skylark 3f, 371 points; (2) B. J. Davey, Skylark 3f, 327; (3) D. C. Snodgrass, Skylark 3b, 283; (4) R. Tarver, Olympia, 239; (5) A. H. Baynes and A. Blake, Skylark 3b, 230; (6) T. Docherty, Olympia, 219; (7) H. Greenway and partner, Olympia, 183; (8) R. Parkinson, Olympia, 153. Total entries, 15.

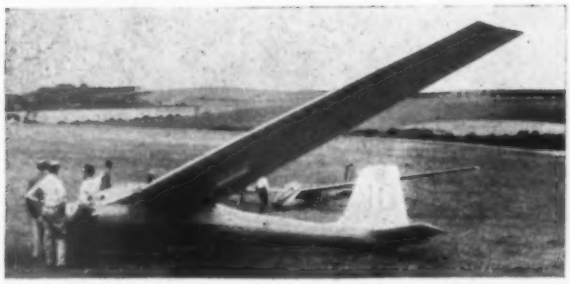
National Soaring Week, Yorkshire Gliding Club, Sutton Bank.

Final results: (1) R. S. Waller and J. P. Griffiths (Cambridge UGC), Swallow, 600 points: (2) H. Doktor and R. A. Hellewell, Swallow, 87; (3) A. D. Hill, Swift, 50; (4) G. Harwood (Crown Agents GC), Swallow, 39. Total entries. four.

Left, at Odiham: among the sailplanes taking part in the RAF and inter-Service meetings was the prototype 15-metre Olympia 460

Below left, at Dunstable: Peter Scott's Olympia 419 is prepared for launch (David Carrow's Mucha Standart in background)

Below, also at Dunstable: Geoffrey Stephenson pushes his Skylark 3 up to the launch position. He did not fly on the final day



Aerobatics for Beginners

BY HUMPHREY WYNN • "FLIGHT"
PICTURES BY IAN MACDONALD

Basic Manœuvres in a Jet Provost T.3

AT about 1120 one morning last month I suddenly found myself flying inverted over the Nottinghamshire countryside, at about 6,000ft, in a Hunting Jet Provost T.3. My pilot, Flt Lt Norman Clayton of No 2 Flying Training School at Syerston, trimmed the aircraft to fly hands off and then rested his elbows on the coaming above the instrument panel. This was not a calculated gesture, but it could not have been better designed to give me confidence in the Jet Provost's behaviour as an aerobatic mount. My good opinion of its amenable qualities was further enhanced when Norman Clayton later showed me what is called "recovery from the vertical." In this manœuvre the aircraft is put into a vertical climb as for a stall turn. But instead of rudder being applied at the approach of the stall the wings are kept straight, with the tip-tanks at about 85° to the horizon. As speed falls off the stick is held centrally, then as all forward movement is lost the Jet Provost either noses over or falls back into a vertical dive, the usual recovery procedure being applied. This manœuvre is shown to pupils before they embark on stall turns, to indicate how the aircraft behaves when standing on its tail and bereft of forward speed.

I had gone to No 2 FTS for an aerobatic sortie *in statu pupillari*, to see how aerobatics are taught to RAF pupil pilots doing their

"Making like a bat": the Jet Provost T.3 (above), with Flt Lt Clayton as pilot and Humphrey Wynn as pupil, in inverted flight; and, at right, going up to the top of a loop —the manœuvre which students are encouraged to "try out for themselves," before being told the correct procedure for this first and easiest form of aerobatics

Aerobatics for Beginners . . .

ab initio training on the Jet Provost; and I was fortunate enough to have two trips with Flt Lt Clayton, who is a distinguished exponent of solo aerobatics on the JP3.

On the first, we were accompanied by another Jet Provost, flown by Flt Lt John Sweet, who is also an instructor at No 2 FTS. He had with him *Flight* photographer Ian Macdonald, whose pictures illustrate this article. They were planned to show the attitudes of the aircraft during basic aerobatic manœuvres, and successfully capture the loop, the run-up to a stall turn (shown on the preceding page) and the beginning of a roll. We realized from a preliminary discussion, however, that some manœuvres in a rolling plane were virtually impossible to follow in an accompanying photographic aircraft.

It was a mixed morning when we flew our first sortie, cu-nims boiling up like mushroom-shaped thermonuclear clouds, dazzling heaps of cumulus like white candy-floss and the River Trent far below streaked with a sluggish detergent tide. Flt Lt Clayton put the Jet Provost through several loops for Macdonald's benefit, pulling up at about 240kt (some 20kt faster than normal), as is the procedure in formation aerobatics. For this reason, and partly because I am not habituated to such manœuvres, I felt the g effect quite strongly when we pulled out of the dives. We also did several slow rolls, with the photographic aircraft either abreast

"Over the top, the rear horizon should be watched through the canopy, and the aircraft eased out of its dive with smooth pressure on the control column"

or in line astern. When Macdonald (who is a perfectionist in these matters) announced over the R/T that he was satisfied, the two machines parted and we were left to our own devices.

At that moment he heard John Sweet say that we were "making like a bat"—an apt description of Clayton's sudden inversion, which took me unawares, particularly as my harness was not quite as tight as it should have been (a point I remedied before my aerobatic lesson).

However, I was not given much time to ponder the problems of apparent weightlessness, for in the next fifteen minutes Clayton went through a brilliant sequence of display aerobatics. In quick succession I experienced for the first time a Derry turn, Cuban eight, glide loop (in which the aircraft uses up about 300ft less vertical air space than in a powered loop), vertical figure of eight, barrel roll, lazy eight and a roll off the top. By the end of this virtuoso performance I was beginning to wonder where my inside was, though my reason asserted itself to ponder just how long it took to acquire the skill to perform these manœuvres with such apparent ease.

The answer came, at least partly, on our second sortie; for during this Flt Lt Clayton gave me dual instruction (such as a pupil would receive) in the loop, stall turn and roll, manœuvres from which all other aerobatics are derived. He made the point that a student's introduction to aerobatics is gradual. For example, the climb forms a preliminary to the loop, an important point being to keep the aircraft straight. Pupils are encouraged to try a loop (under dual supervision), before being told the procedure.

My own efforts came off with reasonable success, though I had some difficulty in keeping the aircraft straight when inverted. Initial speed is 220kt, then the stick is pulled firmly backwards, pressure being relaxed somewhat as the aircraft comes up to the inverted position. Over the top, the rear horizon should be watched through the canopy, and the aircraft eased out its dive with smooth pressure on the control column.

I found the Jet Provost a delightful machine to roll, managing to get round successfully on my own after having twice "followed through" with my instructor. One difficulty I experienced was that of keeping the nose up, since I inadvertently applied bottom

"Starting speed for the slow roll is 180kt, then the nose is raised slightly above the horizon and stick movement applied . . ."

"I found the Jet Provost a delightful machine to roll . . .

. . . managing to get round successfully on my own after twice having 'followed through' with my instructor"

rudder instead of top through forgetting that the effect of controls is reversed when the machine is inverted. In this, as in other aspects of aerobatics, correct procedure must be followed even when one's instincts beckon elsewhere. Starting speed for the slow roll is 180kt, then the nose is raised slightly above the horizon and stick movement applied to left or right as required. Remembering slow rolls in Tiger Moths, with the considerable amount of stick pressure needed, I was pleasantly surprised to discover how quickly and easily the Jet Provost goes round.

It was before showing me stall turns that Flt Lt Clayton demonstrated "recovery from the vertical" procedure. Here again, I thought, instinct must be resisted; for with the nose pointing straight upwards and the aircraft hanging in the sky, one is tempted to push the control column forward. But I was in calm and experienced hands: the stick was held central and the rudder pedals straight; and the aircraft conclusively proved that it could very well look after itself, gently nosing-over into a dive.

Stall turns, which are initiated with a shallow dive to 200kt, were as pleasant as rolls. I was instructed to line the aircraft up on some straight feature on the ground, such as a stretch of railway (like the Newark - Grantham route below), and to keep the wings straight on the climb by the use of ailerons. (In this, as in other manœuvres, the T.3's tip-tanks form a useful guide to the vertical.)

What you can do when you're an expert: the No 2 FTS formation aerobatic team, led by Flt Lt W. D. P. Jones, with Flt Lts D. J. Rowe and R. T. Stock as Nos 2 and 3 and M/Plt J. McTavish as No 4

The control column should be eased slightly forward at the top of the climb, and if rudder is applied at the right moment the aircraft should cartwheel cleanly on its own axis. (I noticed that as the speed fell below 120kt a warning notice with the legend "U/C up" flicked on the ASI.) In one of the stall turns we did the aircraft "hammered out," due to a slightly too low airspeed. Co-ordination of rudder and ailerons is important to prevent a rolling motion, induced by the use of rudder.

While we had been completing these manœuvres in a reasonably clear area of sky to the south-west of Syerston a heavy rainstorm progressed gradually westwards from Newark towards the airfield. We descended into the No 2 FTS low-flying area, where I experienced some runs and turns for a few minutes, then headed back towards base. As I had done the take-off, Flt Lt Clayton also gave me the pleasure of a landing; and as our first approach was thwarted I also sampled an overshoot, doing the second circuit at 800ft because of the low ceiling. The Jet Provost greased on to the runway (more by beginner's luck than judgment, I suppose) and I came to the end of our 45min flight well satisfied that the T.3 with its Bristol Siddeley Viper engine is a training aircraft on which beginners can enjoy their first experience of aerobatics with both confidence and pleasure.

Three British - owned Piaggio P.166s on the apron at Luton. G-APYP belongs to John Laing, G-APSJ is on bare-hull charter from McAlpine Aviation to the Marley Tile company, and G-APWY, ex-Blackwood Hodge, is owned by McAlpine

Sport and Business

AUGUST BANK HOLIDAY MONDAY was again the occasion for the Tiger Club circus to entertain a substantial crowd at Fair Oaks with a highly professional display of light-aircraft flying. Right on time, the club arrived in two formations—one of five Turbulents and another a mixed bag of Tigers, a Jackaroo and a Turbulent—overhead Fair Oaks at the start of a rather weather-beaten afternoon, in which the piling storm clouds were not the least impressive part of the show. Tiger aerobatics figured prominently in the proceedings and it was Popoff in the Deacon who led off the afternoon's display with a performance of Coventry standard of excellence. While he was absorbing the whole attention of the crowd, the first stick of three parachutists dropped from a formation of Tiger Moths in a race for a marker in the centre of the airfield; nine took part altogether and a jump-off by the heat winners—the most accurate in their jumping as well as the most agile on the ground—was won by John Hogg with Bernard Green runner-up.

Tiger Club formation flying is now of a high order, and includes some formation changing as neat, in its way, as the best that the RAF can provide. This was demonstrated both with five Turbulents, who ended their display by cutting through the toilet rolls they had dropped, and then by a tied-together formation of Tigers. The latter, led by "Bish" Bishop, with Benjamin and Elton as wingmen, achieved their take-off, landing and position-changing without the least danger of breaking (or even stretching) the bunting that bound them together.

Interspersed between rain showers and display items were demonstrations of the Jodel Ambassadeur and Mousquetaire, a rather high fly-past by a Tri-Pacer and a lively low-level performance by David Phillips in the Linnet and—for the first time—a demonstration of the very literally home-built Taylor monoplane.

The final item, after a tremendously spirited flour-bombing cricket match against a solitary batsman, was the popular Turbulent race, convincingly "won" by scratch-man Peter Phillips.

A TELEGRAM received by the British Gliding Association on August 4 from Philip Wills disclosed that the veteran glider pilot had finally achieved the 500km distance flight needed to complete his Diamond C. The telegram read AT LAST 332 MILES ODESSA DECOS ODESSA HASKELL, and was sent from Odessa, Texas, where Wills was flying in the US national soaring championships.

First Englishman to gain the Gold C gliding badge (in June 1938), Wills achieved his goal diamond in June 1951 and height diamond in July 1952. He had made many attempts at the remaining hurdle, the 500km distance leg, but had always failed—usually by the most frustratingly short margin. He is the third British pilot to complete his Diamond badge, the other two being Nicholas and Tony Goodhart.

ACTIVE CIVIL AIRCRAFT registered with the United States Federal Aviation Agency now exceed 70,000, of which some 2,000 belong to scheduled and supplemental airlines. The remaining "general aviation" machines total 68,727, of which 6,034 are multi-engined, 27,301 are "single-engined, four-place and over" and 35,392 are smaller single-engined types. Thirty-five per cent of the total number are registered in five States—California (8,761), Texas (6,187), Illinois (3,791), New York (3,334) and Ohio (3,109).

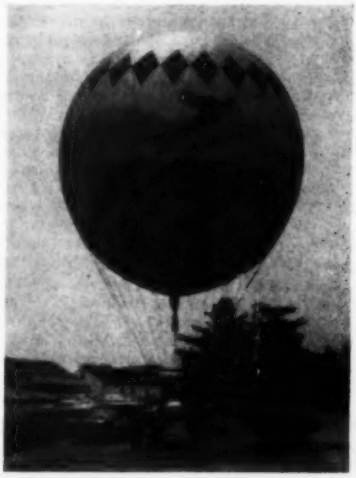
IT WAS REPORTED from Moscow on July 30 that "An ornithopter, a heavier-than-air aircraft with moving wings, designed by D. Ilyin, has passed its bench tests. A group of designers are building a sailplane with moving wings. Designer A. Ivanyuta is continuing to work on a combination of bicycle and ornithopter." The report added that "it is quite likely that the first ornithopters will rise into the air in the USSR," and that very light engines had already been designed for these aircraft. Calculations made on the basis of wind-tunnel tests were said to indicate that ornithopters were highly economical. In the near future, it was suggested, they might become the flying counterparts of the midget car or motorcycle.

RETROSPECT

From "Flight" of August 13, 1910

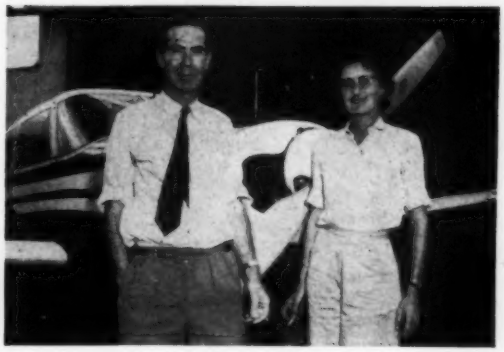
Latham Flies to Dreux. Although Latham was at Issy on Sunday morning, he felt too tired after his long flight of the previous day to start in the Circuit de l'Est competition. Later in the day, however, he set off to fly to Dreux, where his mother is residing, and landed safely in front of her chateau after an hour's trip, and just in time for dinner.

A Correction. In our account of the flying at Brooklands on Bank Holiday, it was mentioned that Mr. L. D. Gibbs was out on his machine. As a matter of fact, however, the flights were made by one of his pupils, whom our correspondent mistook for Mr. Gibbs, Mr. Gibbs being away in Paris at the time.

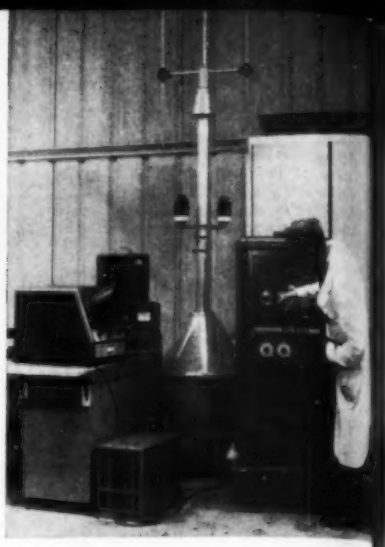


"La Coquette," featured in the film "Around the World in 80 Days," is owned by the Balloon Club of America. On this recent occasion in Camden, N.J., it was flown by ***Francis L. Shields***

Below left, car dealer Raymond Way (left) takes delivery of Tri-Pacer G-ARCD from F. A. Dismore, general manager of W. S. Shackleton Ltd. Below right, June Wright and John Falconer-Taylor with a Wilken Air Services (of Nairobi) Comanche flown from Aketi, Bunia, Paulis and Buta during the recent Congo airlift



FLIGHT SYSTEM SURVEY



Ekco CE.178 CRDF equipment being tested in the new factory of Ekco Electronics Ltd at Rochford, Essex

Fido Development

PROGRESS towards the development of a modified form of Fido fog-dispersal system has been such that the MoA is planning a demonstration to airlines during next month. It is understood that the new Fido has been developed by MoA in conjunction with certain manufacturers and that it burns fuel oil without smoke and requires no warm-up time. According to Parliamentary answers, other systems, including one employing an "electrical spray" and another using liquid propane, were either of marginal effectiveness or raised storage difficulties.

The cost of installing the new Fido at London Airport would be about £700,000 and operating expenses would be about £280 for a landing and £70 for a take-off. It remains to be seen whether the demand from the airlines is sufficient to warrant installation, but considerable interest has been shown in the US and France.

Inertial Demonstration in Britain

A NORDEN miniature all-attitude inertial platform was recently demonstrated by Ketay Ltd, a company of the Plessey Group, to senior RAF and RN officers and MoA officials. Norden is a division of United Aircraft Corp in the US. The platform contains three Norden miniature integrating gyros and three precision accelerometers in a three-axis, four-gimbal configuration, and weighs less than 20lb. It is said to give very accurate attitude, heading and acceleration information for aircraft or space vehicle applications and forms the basic unit of a system which can provide stabilization and inertial navigation facilities.

Doppler Inertial System for P3V-1

THE Lockheed P3V-1 anti-submarine aircraft is to have Doppler inertial navigation equipment in which the inertial element is provided by the Electronic Equipment Division of Litton Industries and the Doppler radar by Ryan Electronics. It is reported that the system is to be employed for both long- and short-term flights and that the Doppler is of the AN/APN-122(V) type now being made by Ryan for land-, sea- and carrier-based aircraft for attack, anti-submarine and airborne early warning rôles as well as for helicopters. APN-122 can be combined with position and course computers, inertial systems, bombing directors, terrain clearance radar, integrated flight systems, and autopilots. In helicopters it serves automatic hovering controls and has been ordered for Fleet Air Arm Wessex helicopters.

Ryan now have orders worth $51m for the APN-122 and also produce other types of Doppler.

New Honeywell Scanners

A RANGE of simple scanners bridging the gap between electronic strip chart recorders and complex data-handling systems has been developed in Britain by Honeywell Controls Ltd. They will scan process variables at two or seven points per second and have, instead of a print-out system, only an alarm and an annunciater panel to indicate points scanned and points off-normal. Applicable to process industries where permanent records are not necessary, the new scanners compare incoming voltage against pre-set alarm levels and are produced in three main types, with optional facilities including flashing alarms, recycling, alternative input switches and a means of varying the number of inputs and set points.

Precision gyros being assembled for the Ryan AN/APN-122(V) Doppler which is to be combined with an inertial system by Litton Industries for use in the Lockheed P3V-1 anti-submarine aircraft *(see col 1)*

DME for Light Aircraft

THE Bendix Corp has developed a new type of distance-measuring equipment and demonstrated it to the FAA and US Army Signal Corps Research and Development Laboratory. Designated NVA-203A, the device weighs 5.3lb in prototype form and is housed in a short ½ ATR case. Operating in the normal VHF frequency band, it forms an accessory to the normal communications radio. Distance-measuring signals interrupt communications for 0.5sec.

The range-measuring cycle is initiated by the interrogator station, which transmits a precise 750c/s tone through the communications radio. The signal is received at the responder station, which stores the tone by ringing a tuning fork in phase with the received 750c/s. A fraction of a second later this signal modulates the responder carrier. The transponder signal is received by the interrogator and its phase compared with that of the original transmission. The distance measured from the phase difference is displayed on a meter.

The accessory unit contains the audio frequency circuitry and timing and switching circuitry to store the tone and perform phase comparison. Periodic measurements may be automatically made or single measurement initiated by manual command. Later versions will have a selective calling device. NVA-203A responders might be installed at VOR beacons to provide light aircraft with range information, or they might be combined with marker beacons to give range measurements during ILS approaches.

DMET and Terminal Radar

THE first purchase of Tacan-compatible DME has been announced by the FAA. A contract with International Telephone and Telegraph Co worth $856,000 covers 20 beacons and spare parts and it is stated that other agencies will be able to buy dual beacon units and aerials, without spares, for between $36,434 and $32,666, depending on the quantity involved. This offer is to stand for one year. Numbers of Vortac beacons are already installed in the US for joint civil and military use.

A new terminal radar called ASR-4 is to be supplied for 34 major US airports by Texas Instruments Inc under an $11,000,000 contract. The ASR-4 has a range of 60 miles at up to 25,000ft and incorporates video mapping, MTI and devices to eliminate rain clutter. ASR-4s are already being installed at Newark, Orlando and Little Rock and 48 other radars will be modified to bring them up to ASR-4 performance.

Transponders for Business Aircraft

BOTH the Hazeltine Technical Development Center, Indianapolis, and the Wilcox Electric Co, Kansas City, now have FAA contracts to develop cheap, lightweight radar transponders suitable for light and executive aircraft. Experimental versions should be delivered for evaluation in about a year and the companies state that production versions would weigh about 14lb and cost about $1,000. The FAA states that, without transponders, radar control involves too much radio traffic and manœuvres on the part of the aircraft. Transponders are already obligatory in jet transports and are also fitted in some other types.

AIR COMMERCE

Sir Matthew on Supersonics

On his first day in office, July 29, Sir Matthew Slattery was in the BOAC engineering departments at London Airport talking to staff. Five days later the corporation's new chairman held a news conference in London, as reported on this page

THE supersonic airliner is going to be built "more or less regardless of the economic consequences," and if that is going to happen "I don't intend that BOAC shall be behind in the race and not ready to accept the challenge." This was said by BOAC's new chairman, Sir Matthew Slattery, at a news conference on Wednesday of last week.

He began by saying that he had originally intended to meet the Press to answer questions; but he had decided to say something first about the supersonic airliner. In fact virtually the whole of the meeting was devoted to this topic.

The supersonic airliner, he said, "is one of the most interesting problems we have been faced with for many years." In his mind the problem fell under three headings: "(1) Would the supersonic airliner confer any benefits on mankind? (2) Would it be economic? (3) What were we going to do about noise?"

So far as benefits were concerned, he did not think that the supersonic airliner would benefit the tourist. And he doubted whether it would be necessary for the businessman. "I am probably getting old," said Sir Matthew, who is 58, "but I don't want to fly to New York in 2½hr. I rather look forward to six hours away from telephones and perhaps a quiet snooze on the way."

So far as economics were concerned there was not really a difference of opinion between him and his predecessor. [The previous week, presenting BOAC's 1959-60 report and accounts, Sir Gerard d'Erlanger had said that there would probably have to be quite a considerable surcharge, 15-50 per cent, for supersonic travel. "That's your problem," he had said to Sir Matthew, "and you are welcome to it."] The difference was one of timescale. Someone was going to do it anyway "and we cannot be left out of the race." We were not yet in a position to be positive about figures—"not until we have outlined our requirements to the industry"—until designers had done a year's work on such things as drag and fuel consumption.

Operating costs might be 10-50 per cent higher than subsonic costs. It was clear that the numbers were going to be quite small: "A country such as ours," he said, "will be lucky to sell 25 aircraft." Research and development costs of £50m-£60m had been mentioned, excluding engines. If only 25 aircraft were built cost might be as high as £4½m-£5m per aircraft. Assuming a ten-year depreciation this would mean a sum of nearly half a million pounds to be written down per aircraft per year—and that is "a hell of a lot of money." The cost per c.t.m. estimates showed a difference of 4d per c.t.m. depending on whether 25 or 100 were built. That alone could kill the operating cost. But if it could be assumed that 200 aircraft would be sold "then you might find that the economics might not be sufficiently different from subsonic economics."

"On the score of noise," said Sir Matthew, "we simply cannot contemplate an aircraft that makes more noise than those we are operating today. I don't think the general public—and rightly if I may say so—are going to stand for it." He did not know how we were going to deal with this problem. It would mean the expenditure of a great deal of money, perhaps it would mean a new engine, and a cost greater than the £50m-£60m he had mentioned. Then there was the problem of the supersonic bang. It might not be feasible to operate over great land masses: if the Americans could not do so coast to coast nor could we—"Mr Smallpeice will know all about that, traffic rights and all the rest of it." A date for the introduction of supersonic airliners later than 1970 would suit all the airlines—"we don't want to be faced with throwing away VC10s and 707s only ten years after they come into service." Having said all this, Sir Matthew was emphatic that the race was on and that BOAC must win it.

Asked whether he was going to follow up Sir Gerard d'Erlanger's efforts to get airlines to agree to hold off buying supersonic aircraft, Sir Matthew said it would be a good thing if the airlines could give ten years' notice of their intention to introduce supersonic airliners. As he met his opposite numbers he would mention the possibility in conversation. but "there isn't a hope that anyone will hold off, I don't think."

In his answers to other questions, points made by Sir Matthew were that if there was no agreement he hoped to get the supersonic airliner in about eight years, i.e., by 1968. He was doing his best to persuade the Ministry of Aviation to go to the next step; BOAC would give every help short of an actual order. "We are ready and willing," he said, "and we are urging them on." There was every indication that the government intended to get into the race. In his opinion 1968 was the earliest possible date on which an aircraft could be handed over for route-proving. Eight years was "an optimistic figure," but it might be achieved "if we get on with it tomorrow, not when Parliament reassembles."

Why, he was asked, did BOAC have to win the race? "BOAC's fortunes will depend—not entirely but largely—on remaining ahead." It was a competitive business. Questioned about Mach number, he said that the indications were that around Mach 3 was not economic, and did not fit into the pattern. After Mach 2.2 —and this was guesswork—Mach 3.5 was perhaps the figure.

What about co-operation with the Americans? "If the Western world could have one supersonic airliner then the numbers that could be built would be sufficient to make sense." Was not BOAC missing an opportunity to strike a blow for sanity? The gist of his reply was that if BOAC was not competitive it would suffer losses—and "I am not going to get much sympathy if I explain the losses by saying that I conferred a great benefit on humanity, am I?" Was there not, he was asked, a discrepancy between the date of 1968 for a supersonic airliner and his belief that ten years should elapse before the VC10 [due in 1964] was retired? "I don't want supersonic airliners if I have got a lot of subsonic airliners to wear out"—but BOAC could not afford to lose the race.

[*Leading article: page 207*]

BOAC 1959-60: A POSTSCRIPT

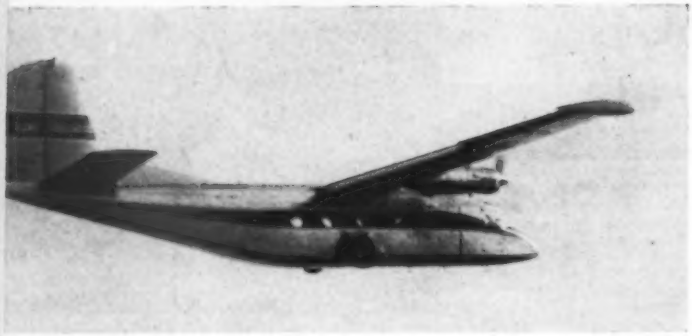
IN reviewing BOAC's annual accounts for 1958-59, *Flight* concluded with the hope that the corporation's results "improve as much in presentation as in content." Having now had an opportunity for considered analysis of BOAC's accounts for 1959-60, we have to report a remarkable improvement on both scores.

On the financial side, BOAC's declared deficit—after allowing for interest payments and results of subsidiary companies and associates—has been slashed from over £5m to well under £1m. It is worth noting that the 1959-60 results have been computed in a straightforward manner whereas the 1958-59 results were presented in such a way as to obscure a real loss of almost £12 million. This latest report is not only more forthcoming in its details of the corporation's activities, but most of the many statistical ambiguities typical of earlier issues have been expunged. And the layout of the accounts has been revised to conform with the best modern accounting practice.

The improvement in BOAC's own finances (i.e., excluding the associates) reflects the fact that costs rose by £9 million (from £65m to £74m) while revenues rose by £13 million (from £66m to £79m). The costs here exclude £4m interest payable on the corporation's capital—a rise of over £1 million (from £2.9m to £4m). A loss of £2m in 1958-59 was converted into a profit of £½ million in 1959-60.

On the revenue side of the operating account it can be seen that there was a slight fall in average revenue rates, a small rise in passenger rates being just offset by falls in mail and freight yields. "Incidental" operating revenues rose from £¼m to £¾m, and net revenues from sale of capacity to pool partners went up sharply from £¼m to £1¼m. (While BOAC's fleets actually flew 476m c.t.m., 5m c.t.m. were sold to pool partners.) "Miscellaneous sales and credits" were £6m—down from £7.4m. This sort of money deserves breaking down in future accounts.

The expenditure side of the operating account shows a 7 per cent reduction in unit cost from 36.2 to 33.8 pence per c.t.m. This change represents a substantial rise in the unit cost of standing charges, up by 0.8 pence per c.t.m. This, however, was more than compensated for by sharp falls in the unit costs of engineering and fuel (down 1.6 and 0.6 pence per c.t.m. respectively). Operating expenditure is analysed in a valuable new table on pages 44 and 45 of the accounts. Among other items this table shows two directions in which costs have been kept down: (1) staff costs remained virtually unchanged at £22.3m despite a 25 per cent expansion in the volume of business (in this connec-



Here is the first air-to-air photograph of Max Holste's Turbomeca Bastan-powered Super Broussard, taken on its 1¼hr first flight on July 29. The pilot was Andre Jouannet. By August 4 the Super Broussard had flown 10hr 20min in seven flights

AIR COMMERCE . . .

tion it may be noted (a) that staff members rose only slightly from 19,010 to 19,131 and (b) that Board remuneration fell from £40,000 to £35,000); and (2), the cost of "communications, stationery and postages" fell from £2.2m to £2.0m. This table also pinpoints those items which have rocketed—aircraft amortization up from £5.4m to £7.5m, fleet insurance doubled from £1.3m to £2.6m.

Turning from the operations of BOAC to those of its subsidiaries and associates, again the picture here is one of overall improvement. The overall loss has been cut by £4m, from £5.1m in 1958-59 to £1.1m in 1959-60. Although BWIA and Kuwait Airways went from bad to worse (in each case, the volume of annual expenditure appears to be out of all relation to the amount of work done), Middle East Airlines showed a vastly improved result. Unfortunately, the BOAC accounts do not provide adequate details of the finances of partly owned companies such as MEA (as opposed to wholly owned subsidiaries such as Aden Airways and BWIA), and for this reason it is impossible to comment on the extraordinary apparent improvement in the Lebanese carrier's affairs. Much of this improvement could, for instance, be no more than a book-keeping adjustment such as the cancellation of provisions now considered unnecessary. In passing, it might be noted that some traffic statistics for BOAC's associates and subsidiaries would not be amiss.

The improved operating results of both the corporation and its associated companies are shown in the corporation's balance sheet. Here again the presentation is much improved; the way in which capital has been utilized is clear at a glance. But the figures are a sombre reminder of BOAC's unhappy past, the accumulated deficit having now reached £15m. In annual terms this deficit involves BOAC in a yearly interest payment of over £½m—perhaps a case of the sins of the father being visited upon the son.

Another feature of the latest balance sheet is the corporation's increasing reliance on short-term capital. The fact that BOAC continues to produce balance sheets with current liabilities in excess of current assets (£29m as against £22m on March 31, 1960) is partly due to the date upon which the financial year draws to a close. By choosing March 31 the corporation necessarily shows a large sum—over £12m in 1960—as a current liability to cover tickets sold in advance for the summer season. Nevertheless, it still seems that BOAC relies on its highly credit-worthy position as a nationalized undertaking to depend on short-term credit to a degree that would be considered imprudent in any private enterprise.

The third major feature of the balance sheet is the extent to which BOAC continues to be overcapitalized. Of the £143m capital—long, medium and short-term—that has been poured into the corporation (excluding subsidies amounting to about £30m in the pre-Thomas era), some £90m are employed on BOAC's current operations. By comparison, revenue from all sources in 1959-60 was £79m. This means that BOAC is still unable to turn its capital over once a year. As managerial and technical efficiency improves, the corporation should be able to achieve a better capital: revenue ratio. Indeed, a well-run airline should be able to turn its capital over at least twice a year. If BOAC fails to achieve more efficient use of its capital its planned future expenditure of £124m could be an alarming prospect, for if the corporation is to be financed by raising fresh capital rather than by ploughing back profits, then interest payments will become a treadmill from which the corporation will never escape. However, if it continues along the course it followed in 1959-60, and provided Sir Matthew can ward off premature supersonic investment, there seems little cause for pessimism.

BEA's VANGUARD DATE IS MARCH 1

VANGUARDS in full service on the London - Paris route on March 1, 1961, is BEA's announced intention, with *ad hoc* schedules before that date—possibly during the Christmas rush. Glasgow services may be introduced in April. But before certification BEA have to amass 200hr of route flying, primarily to clear the modified engines for ARB certification, though some necessary refresher-training of crews will be carried out concurrently. No date has been set for certification, and neither BEA nor Vickers can yet say when the first of the corporation's six V.951s is due to be delivered to BEA. Rolls-Royce are still expecting to despatch the first modified Tynes to Vickers next month. Meanwhile limited flight testing continues at Weybridge with the development V.951 and two TCA V.952s.

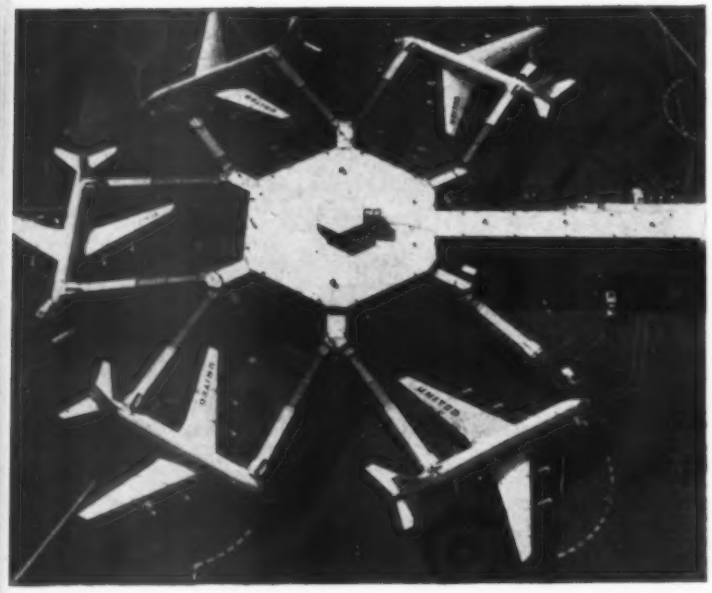
TCA's date for introducing Vanguards, a Canadian correspondent reports, is early January. Their 23 aircraft, all V.952 (Mk 2) series, will follow on after BEA's six V.951s already completed (and which, so far as the airframe is concerned, are virtually certificated). BEA's remaining 14 Vanguards—all V.953 (Mk 2) series—will start to be delivered in July 1961, with six expected to be with BEA by the end of September.

END OF MASCO

AS a result of "administrative reorganization designed to streamline aircraft maintenance," MASCO (The Mid-East Aircraft Servicing Co) in which BOAC Associated Companies had a substantial shareholding, is to be disbanded. It undertook engineering work for BOAC, Kuwait Airways, the Lebanese Air Force, Iranian Airways, Gulf Aviation, the Iraq Petroleum Co, Saudi Arabian Airlines, Iraqi Airways and Aden Airways. Its work is to be carried on by Middle East Airlines. The latter found it an economic necessity to have overhaul and maintenance of their four Comets under their direct control and not done by MASCO on their behalf. The staff of MASCO were offered a transfer to MEA, and Mr W. K. Forsyth, BOAC's manager line maintenance, has become MEA's engineering controller. MASCO's former general manager, Mr George Carayan, has been made assistant managing director (engineering) of MEA.

BOEINGS FOR EASTERN AIR LINES

EASTERN AIR LINES have ordered ten Boeing 720Bs for delivery in 1961. The aircraft will be powered by four Pratt & Whitney JT3C-12s of 13,000lb thrust. The order, worth about $44 million, will be financed either directly by the airline, or by a corporation set up to purchase the aircraft and lease them exclusively to Eastern. It is significant that Eastern, who have bought 40 Electras and 16 DC-8s, have turned to the third of the big West Coast manufacturers for their intermediate range aircraft. They will now share the distinction with PanAm and



Air transport roundabout: United's terminal at San Francisco is equipped with these telescopic "jetways" giving simultaneous access to five DC-8s at the end of the finger

United of being the only airlines to operate both four-jet Boeings and DC-8s. The order brings the total of Boeing 720s sold to 82 and the family total, for all versions of the Boeing 707, to 245. Of these, 140 had been delivered by the end of July.

A SORT OF MISUNDERSTANDING

UNDERTAKING a three-week tour of civil airports and facilities in the United States is a Soviet delegation led by Lt-Gen Georgi S. Shchetchikov, first deputy chief of Aeroflot. That the invitation to Aeroflot should have been confirmed so soon after the State Department broke off talks on a US-Russian civil air agreement seems indicative of the desire of both sides to get down to business.

These negotiations, one of the results of President Eisenhower's discussions with Mr Kruschev at Camp David last November, are aimed at an exchange of traffic rights for Aeroflot and Pan American. The latter has already been certificated for Russian routes by the CAB for fifteen years "if and when agreement could be reached." Such agreement seemed very far away on July 14 when talks which were to begin that day in Washington were called off "until a more suitable time" because of "a mounting campaign of vilification against the United States."

Pouring oil on troubled waters at a conference in Washington last week, Gen Shchetchikov said that "We feel that the cessation of talks between our governments concerning an air agreement was just a sort of misunderstanding—a temporary misunderstanding—and anyhow these talks will be resumed." The Soviet Union was interested in flying to the United States, just as the US was interested in obtaining rights to fly to the Soviet Union.

BRITAIN'S INSOLVENT AIRPORTS

THE Ministry of Aviation are unable to give any forecast of when the 15 principal UK state-owned airports will become self-supporting. The Treasury see no hope of avoiding further substantial deficits over the next few years. These gloomy facts are examined in the report of the Committee of Public Accounts* who say that they are "disturbed" by the size of the deficit.

Can an airport—municipal or state-owned—be made to pay its way? The municipal answer, as expressed by Coventry and Southend, is probably that it can. The Ministry of Aviation's experience so far is that airports lose money and that, in general, big airports lose more money than small airports. Last year there were deficits at London of £2.1 million, at Prestwick (see page 232) of £0.5 million, and at Gatwick of nearly £1 million. Solutions put forward by the Ministry have been to close or to threaten to close some of the smaller airports (Croydon, Blackbushe, Stansted and Eastleigh) and to off-load some of the burden of operation on to municipal authorities. Meanwhile the MoA are advised by the Committee to reduce deficits at state-owned airports by economies in staff and better methods of working. Accounting techniques are being improved as a method of management and "steps are being taken to make the best use of the Trading Accounts . . . by the staff at the airports responsible for their operation."

Airport revenue, as the Committee of Public Accounts were reminded, stems primarily from rents and from aircraft landing fees and passenger charges. Landing fees at British airports are already among the highest in the world (and it is reliably reported that they may go up again), and the service charge is comparable with those charged in other countries; and rents—particularly at Gatwick—have been the cause of some bitter complaint from smaller operators.

Apart from raising landing fees and service charges—matters which the Committee suggest should be "tested constantly" against what traffic will bear—what else can be done to improve the economies of Britain's state-owned airports? The guardians of public accounts recommend simply that operating efficiency should be increased. They might also have suggested a more imaginative approach to aerodrome operation, particularly in the incidental services from which can be derived useful additional revenue. An airport should be a social rendezvous: restaurants, hotels, spectator enclosures, duty-free shops and guided tours are all potential sources of income relatively independent of aircraft movements. Business aircraft might be encouraged to use Britain's airports by readier "special VFR" access through control zones.

Another question the Committee examined was: Should local authorities be required to take on the entire expense of operating their local airport? Previously, the Ministry "has been reluctant to charge" for technical and other services now provided free. Manchester is a case in point. Up to March 1959 the Ministry contributed about £1 million towards the cost of capital works and provided technical services at a cost of about £183,000. The MoA have the right to levy charges for technical services, but this was in no case exercised. With transfers of airport authority under negotiation at Liverpool, Cardiff and Blackpool and agreed at Elmdon, this is a matter, the Committee suggest, that should now be reviewed. A proportion of receipts from landing fees might be paid to the Ministry towards the cost of technical services, since for the State to continue to provide technical services as these airports expand can, it is argued, result only in an increasing burden on the taxpayer.

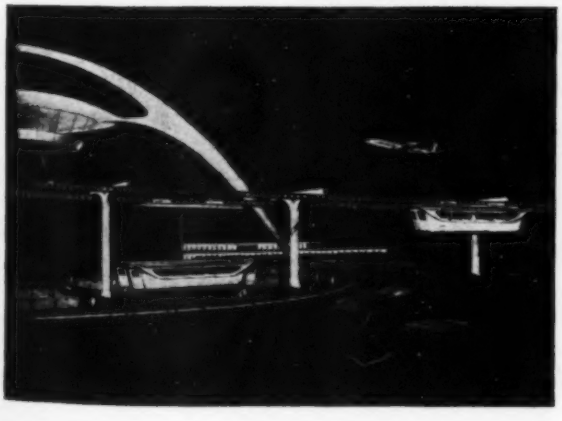
But increasing the costs of municipal operation seems, on its own, a stony path towards airport solvency. A bolder, more fundamental solution might be for the Treasury to make more readily available through the Ministry of Aviation long-term capital for airport development to an economic level of utilization.

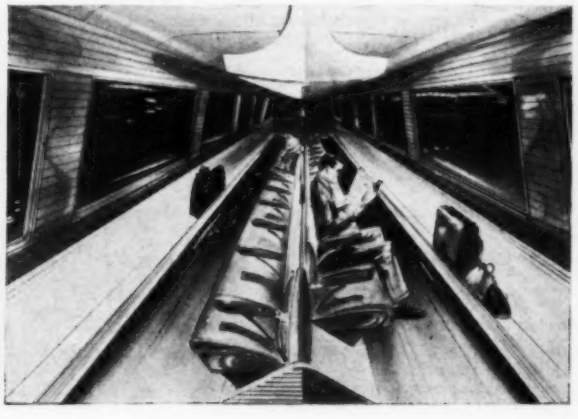
A. T. P.

* *Second Report from the Committee of Public Accounts, Session 1959-60. Price 2s, HMSO.*

Now back from India, the Argosy demonstrator brought home this record of the "Rolamat" loading system being demonstrated to Mr V. K. Krishna Menon and Gen K. S. Thimmaya, Chief of Army Staff, by Mr Peter Fowler, Hawker Siddeley representative in India

Suggested by the American Crane and Hoist Corporation for transport around Los Angeles Airport is this "rapid transit system" of 25-seat overhead bi-rail cars. They would be lowered by hoists at ticket buildings, car parks and at other convenient points





Lufthansa's first Lockheed L.1649A has been converted to all-freight configuration by Lockheed Aircraft Service. "Remanufacture," as LAS term it, comprises cutting openings for two cargo doors and adding heavy-duty L.1049H floors and tie-downs. In the larger photograph the aircraft is being prepared for flight from Ontario International Airport, California

AIR COMMERCE . . .

WORLD'S BIGGEST AIRLINE

THERE may soon be no doubt which airline is the biggest in the world. If United Air Lines' proposed take-over of Capital Airlines (*Flight* last week) is approved by the CAB, United will become the biggest passenger-carrier, and perhaps the biggest by any index of measurement.

Roughly speaking United's domestic network extends from east coast to west coast, while that of Capital is mainly an eastern network running from north to south. The take-over would give United access to 46 new points sustaining an aggregate population of between 10 and 12 million—a new market, in other words, the size of a country like the Netherlands. Of the 46 new points, nine have a population of more than half a million, and two—Minneapolis-St Paul and Buffalo—are among the fifty-odd cities of the world with a population of more than a million. And United may now serve 17 of the 20 biggest US cities.

More specifically, the take-over gives United access to important points such as Miami, New Orleans and Atlanta in the south and Minneapolis-St Paul and Buffalo in the north. But more significant than a mere list of new points are the routes on which United's position may now be greatly strengthened. For example, UAL will be easily the strongest carrier on the Chicago - Washington route in competition with American, and likewise on Chicago - Detroit, a market in which Capital have always been the leaders. And UAL's position will be similarly strengthened on the routes between New York and Chicago, Cleveland, Pittsburgh and Detroit, on the last-named of which it will now get a direct service. It should be noted that Capital's plum route to Miami is not from New York, like those to Atlanta and New Orleans, but from the Great Lakes cities, in all of which United will be more firmly entrenched than before.

It is reported that some of the local-service lines, including Piedmont and North Central, have applied to the CAB to take over a great many of the less profitable short-haul local service sectors operated by Capital. Probably UAL will not shed many tears handing over these routes to specialist local service Friendship operators.

Footnote: United ranked No 3 in 1959 among the world's biggest airlines in terms of passengers carried. They flew 7½ million passengers, being exceeded by American and Eastern, the latter being No 1. But Capital have been No 5 with more than 4 million passengers. Obviously, in the table (col. 1) the United and Capital figures cannot be added together to derive a measure of the prospective size of the new United, since, as explained above, many Capital routes will either be duplicated or given up.

TOP TEN US AIRLINES

Airline	Passengers	Passenger Miles	No. of Aircraft	No. of Employees
Eastern	9.6m	5,025m	228	17,764
American	7.75m	5,737m	204	23,747
United	7.54m	5,161m	196	21,439
TWA	5.9m	5,673m	185	19,909
Capital	4.16m	1,612m	92	7,838
PanAm	3.2m	4,594m	140	22,121
Delta	3.1m	1,619m	86	7,371
Braniff	2.17m	1,032m	67	5,382
Northwest	2.14m	1,751m	67	7,257
National	1.93m	1,168m	50	4,291

Note: 1959 figures, source Airlift.

. . . AND CAPITAL'S CREDITORS

WHAT do Vickers get out of the United-Capital merger? As reported last week, it is proposed not only that 15 of Capital's Viscounts are to be returned to Vickers, but that also the British manufacturer will receive $15.9m (£5.7m) of new United Air Lines 5½ per cent preferred stock, 60,000 shares of United's common stock, with the right to purchase up to about the end of 1967 200,000 shares of common stock at $45 (£16) per share.

The value of 15 used Viscount 745Ds on a second-hand market is probably not more than £200,000 each, or £3m for the fleet. Failing outright sale, Vickers could probably lease these aircraft, which might command a rental of about £5,000 per month. The value of the proposed Vickers shareholding in United would appear to be high, but would US anti-trust laws allow such a deal? Past experience, particularly in respect of Howard Hughes and the relationship of his manufacturing and airline interests, suggests that it is difficult enough for even an American aircraft manufacturer to be associated financially with the airline business.

AIRMAIL ANNIVERSARY

TWENTY-ONE years of airmail service between Britain and North America was celebrated by BOAC on August 5. On that date in 1939 the Short C class flying-boat *Caribou* inaugurated the first airmail service from Southampton to New York via Foynes (near Shannon), Botwood, Newfoundland and Montreal. Journey time was 36hr 34min of which flying time was just over 31hr. Eight round trips were made by *Caribou* and *Cabot* before the outbreak of war and mail comprised the entire payload. The aircraft, it may be recalled, were flight-refuelled by Harrow tankers after taking off from Foynes on westbound flights and Botwood on the return.

Over the past decade, BOAC's mail traffic has almost doubled,

United front: modelling for the cameras are the men behind the great US airline merger discussed on this page. Mr Thomas D. Neelands, chairman of Capital, thrusts a Viscount at Mr W. A. Patterson, president of United, while the latter tucks a DC-8 firmly under his arm

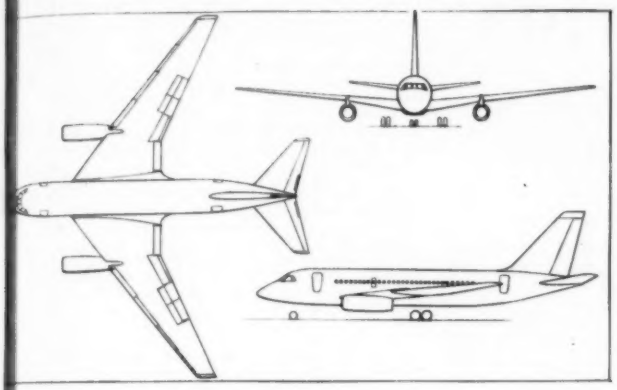
from a total of 11.8m revenue l.t.m.s. to 22.5m l.t.m.s. About a quarter of this (5.4 l.t.m.s.) was carried on Western routes but the proportion is increasing. The gain over last year was 22.9 per cent, while post office mail on Eastern routes increased by only 4.1 per cent. The average increase for all routes between the year ending March 1959 and March 1960 was 8.1 per cent.

CONVAIR'S SMALL JET

PORTRAYED below is the appearance of Convair's Model 60 short-range transport. It is to be powered either by two Pratt & Whitney JT3D-10 turbofans of 20,000lb thrust each or by two turbofan General Electric CJ805-41C1s which would increase the total power by another 4,000lb.

According to *Aviation Week* the 60 leans heavily on the aerodynamic, structural and systems design of the Convair 880. A number of configurations are being shown to airlines in the course of a current market survey and Eastern, who have recently ordered Boeing 720s, are among those said to have expressed an interest.

Maximum take-off weight of the Model 60 is 145,000lb and maximum payload 19,565lb. The aircraft has been designed to cruise at M0.82 at 25,000ft and operating cost over a range of 1,200 nautical miles is said to be 1.4 cents per seat n.m. in an 85-passenger configuration. Another version, with four instead of five-abreast seating, will have accommodation for 68 passengers at 38in pitch. An obvious characteristic is the multiplicity of even smaller windows than the Model 60's big brothers the Convair 880 and 600. While those of the Convair 880 measure 10×14in, these are only 9×12½in. Interior planning includes 70 cu ft of carry-on baggage capacity forward and 60 cu ft aft; there are two entry doors of equal size.



Dimensions: Span, 120ft; sweepback, 35° at 30 per cent chord; wing area, 2,000 sq ft; length, 109ft 5in; height, 36ft 3in.

Payload accommodation: Fuselage outside width, 11ft 6in; forward lower cargo hold, 208 cu ft; aft lower hold, 255 cu ft; maximum seats at 38in pitch, 85.

Weights: Maximum take-off weight, 145,000lb; operating weight empty, 80,860lb (85-seat version); maximum fuel weight, 44,000lb; maximum zero fuel weight, 102,000lb; maximum landing weight, 140,000lb.

Performance: Maximum cruise speed at maximum cruise thrust at 110,000lb, 586 m.p.h. at 19,500ft; 585 m.p.h. at 25,000ft; 576 m.p.h. at 30,000ft; range with normal payload, maximum cruise thrust at 25,000ft, over 1,600 n.m.

HUSHING THE CARAVELLE

AIR FRANCE have recently introduced jet silencers at Paris for ground running their Caravelles. They are manufactured by the French Bertin company and are said to reduce the volume of noise of the two Avons by about 30 decibels, i.e., to about one-thousandth of the original noise level. Residual noise level at full power measured by the Paris Airport authorities is said now to be 85 decibels 330yd from the noise source. No plans have been announced for silencing Caravelle 1s in the air, and the first version to be equipped with noise suppressors should be the Caravelle 3. This seems timely, since there is ample evidence from the vicinity of London Airport that, on its climb-out, the Caravelle is among the most penetratingly noisy of all jets, Boeing 707s and DC-8s not excepted.

Ground silencers for Air France's Pratt & Whitney JT4-powered Boeing 707s are being supplied by the US Industrial Acoustics Corporation; they are of the type which fit directly on to the engine itself.

BREVITIES

Mr L. E. Moore, general manager of Dan-Air Services, was appointed a director on July 25.

The fifth Airline Public Relations Conference will be held under the auspices of IATA in the Palacio Hotel, Estoril, Portugal, between November 28 and December 1.

Japan's Aviation Industry Association is urging the Japanese Government to sponsor research on a large supersonic Mach 2 transport to be ready in ten years' time at a cost of about £20 million.

Republic Aviation announce the sale of two five-seat Alouette helicopters (Artouste 2C gas turbines of 480 h.p.) to Air Florida, who are to inaugurate a charter service in the Tampa—St Petersburg area.

Curtis & Greensted Ltd is a new company formed by Mr Maurice Curtis and Capt L. B. Greensted to meet the demands of "all aspects of aviation." A comprehensive range of services to users and producers of air transport is offered. Address: Chichester House, 278/282 High Holborn, London WC2 (CHAncery 4011/3, ext. 16).

Mr Harry Collis has been appointed BEA Sales Manager, United States. He was formerly sales development manager

Recently in Toulouse, continuing BEA's evaluation of the Breguet 940, were Mr Peter W. Brooks, technical assistant to the chairman, and Mr R. H. Whitby, the corporation's performance analysis manager.

TEAL will be able to extend its trans-Pacific service beyond Tahiti to Hawaii and California following an agreement with France announced in Wellington last week by the New Zealand Prime Minister, Mr Walter Nash.

To be shown at the SBAC Display is Westland's design for a future London heliport, which might be built over the Thames between Waterloo and Blackfriars bridges. The location is tentative, interest centring on the design of the heliport.

For the first time since the war, no civil aircraft will be allowed to fly over the United States and Canada—for a period of six hours on September 10. A defence exercise, Skyshield, controlled by the North American Air Defense Command, is timed to operate between 0100hr and 0700hr. The airlines have been asked to co-operate by re-scheduling.

Nepal has become the 79th member state of ICAO.

NASA test results in slush for a 210,000lb jet show that a 4,200ft take-off on a dry runway increases to 4,500ft in ½in deep slush, 5,250ft in 1in, 6,400ft in 1½in, and 9,000ft in 2in.

A Convair of Deutsche Flugdienst from Dusseldorf and Frankfurt crashed at Rimini on July 21 whilst making a one-engine landing. One woman lost her life among the 30 passengers and crew of four on board.

The new sales manager for MEA in the United Kingdom and Eire is Mr R. M. S. Rayner. He replaces Mr H. Noun who is returning to Beirut to take up a senior position at the airline's headquarters.

A Cossor CR.787 primary surveillance radar is being supplied to the East African Directorate of Civil Aviation for airfield control at Nairobi Airport. Delivery will be completed this autumn.

BEA intend to wait until the main ILS instrument runway at Venice Marco Polo is ready before operating there, and will not do so this month as reported in *Flight* for July 22.

The new internal New Guinea services which TAA are now operating add 44 new places and another 7,579 unduplicated route miles to Australia's already "most extensive" airline network. Total number of TAA points now served is 140, and route mileage is 37,000 unduplicated.

The completion of runway extensions at Rio de Janeiro Galeao now make it suitable for Comet 4 operations, and BOAC included Rio in its services from London to Santiago as from August 1. PanAm were due to introduce 707s through Rio on August 3.

A jump of 33 per cent in the number of transactions settled in the IATA clearing house in London is reported by the first quarter of 1960. The sum involved was nearly £92.5m. The large increase is partially attributable to a rearrangement of clearing procedures by two members: normal increase is nevertheless estimated to be 24 per cent.

A recent estimate of the cost to Lockheed of modifying all the Electras that are in service is about $25 million (nearly £9 million). American Airlines will start to send its aircraft for modification five at a time between the beginning of November and July next year. FAA certification of the modification is hoped to be obtained by December 16. The first of 40 Eastern Electras will go back on November 17, for an estimated 30 days per aircraft. Meanwhile this airline will re-introduce 12 L.1049As. KLM are to send their ten Electras back at fortnightly intervals from November 30.

An Avro Shackleton MR.2 of No 224 Sqn, based at Gibraltar, flying over ships off the Portuguese coast last Sunday in celebrations commemorating the fifth centenary of the death of Henry the Navigator (see "In Brief")

SERVICE AVIATION

Air Force, Naval and Army Flying News

Air Board Member

A NEW appointment to the RAAF Air Board, announced recently, is that of AVM W. L. Hely as Air Member for Personnel in succession to Air Cdre F. Headlam. The new AMP, a former Deputy Chief of the Air Staff, has lately returned to Australia after more than two years as Head of the Australian Joint Services Staff in Washington.

No Smokescreen

RUSSIAN official war historians' dismissal of the Battle of Britain as a "smokescreen" has drawn a sharp comment from Air Chief Marshal Sir Keith Park, who commanded No 11 (Fighter) Group in 1940 and now lives in New Zealand. Speaking in Auckland, he said that had it not been for the German defeat in the air over Britain, Russia would have been defeated in 1942. They had no fighter aircraft of the quality of Spitfires and Hurricanes; and the Germans had been depleted of trained bomber formation leaders after a "bad beating" in the Battle of Britain.

Farnborough "Scramble"

A FEATURE of the RAF contribution to this year's SBAC Flying Display at Farnborough (September 5-11) will be a daily V-bomber "scramble": the first time an exercise of this kind has been staged publicly. It will be recalled that when the Prime Minister visited Cottesmore on April 1 last year, a Victor was airborne 2½min after the warning buzzer sounded, and three more were in the air in under four minutes (*Flight*, April 10, 1959). So the Farnborough demonstration should provide a spectacular contribution to this year's display.

Treble-One Squadron's black Hunters will be making what will probably be their last Farnborough appearance as the Fighter Command aerobatic team, and formation aerobatics are also being performed by Jet Provosts.

No 111 Sqn Accident

A VERDICT of "misadventure" was recorded at the inquest recently on Flt Lt Stanley W. Wood, a member of the Treble-One Sqn aerobatic team, who was killed after his Hunter had touched another aircraft in the formation at the end of a display over Wattisham on June 10. The squadron's commanding officer, Sqn Ldr P. Latham, told the inquest that they could find no rational explanation for the accident. He said: "I gave the order 'break,' and the aircraft started to break away. I heard Wood (No 2) call out 'two.' It sounded quite normal, but seconds later Flt Lt Tom Hussey in the plane ahead said he had been hit. We heard no more from Wood."

Sqn Ldr Latham said that Flt Lt Wood was an experienced pilot. "There was no question of a blackout. He was physically quite capable after the collision, because he operated the ejector seat." The Hunter crashed before the seat had time to work.

The East Suffolk coroner, Mr Norman Butters, referred to the fact that the No 111 Sqn team had had no accidents in the past three years and commented: "In view of the amazing feats you do . . . it reflects tremendous credit on your skill."

No 216 Sqn History

AN appeal has been made by No 216 Sqn, RAF Lyneham, Wilts, for information and photographs from former members and others relating to aircraft and incidents in the squadron's history. Of particular concern is the 1939-45 period, with special reference to the Bristol Bombays flown in the Middle East at the beginning of World War 2. No 216 also wants to know more about the history of its silver—cups, trophies, etc—and anyone who can help is asked to contact Flt Lt R. A. Locke at Lyneham.

IN BRIEF

The Queen and the Duke of Edinburgh were yesterday (Thursday) due to visit RAF Saxa Vord, the signals unit in the north of Shetland.

RAF West Malling was at home to members of the Royal Observer Corps at an "ROC Day" last Saturday.

Gp Capt D. B. Hatfield, at present an Assistant Director in the Ballistic Missiles Division of the MoA, has been appointed an ADC to the Queen.

Gp Capt B. H. Boon has been appointed Controller of RAF Telecommunications at Signals Command headquarters, with the acting rank of Air Commodore.

Air Marshal R. B. Lees, Deputy Chief of the Air Staff, is to be chairman of this year's reunion of No 68 Sqn, at the Dorchester Hotel, London W1, on Saturday, October 15. Tickets (£3) may be obtained from Sqn Ldr P. Smith at 4 Queen Elizabeth Road, Camberley, Surrey (Camberley 2687).

The first reunion dinner of No 93 Sqn is being held at the Victory (Ex-Services) Club, 73 Seymour Street, London W2, on Saturday, September 10. Past and present squadron members who wish to attend are asked to contact Flt Lt G. A. Talbot at the Central Fighter Establishment, RAF West Raynham, Fakenham, Norfolk.

Air Marshal Sir Edward Chilton, AOC-in-C Coastal Command, who is also NATO Air C-in-C, Eastern Atlantic Area, and Air C-in-C, Channel Command, represented the RAF at celebrations in Portugal this week commemorating the fifth centenary of the death of Prince Henry the Navigator. Three Shackletons from No 224 Sqn flew overhead (see heading picture) during a review of warships last Sunday.

A service of thanksgiving for the victory achieved in the Battle of Britain is being held at Westminster Abbey on Sunday, September 18, at 3 p.m. Applications for tickets should be sent in writing to the Under-Secretary of State, Air Ministry (S.4c), Whitehall, London SW1, not later than August 31. Precedence will be given to widows and bereaved parents of Battle of Britain aircrews, and to retired Battle of Britain pilots and RAF officers.

Shape of things to come for RAF Transport Command: the development prototype of the AWA Argosy 660 military transport, which recently made its first flight, showing the rear-opening "crocodile jaw" freight door and one of the two side exits for parachute troops

Straight and Level

LAST Friday Lt J. B. Barnes, USN, took off from Capodichino, Naples, in his F8U Crusader. As soon as he was airborne he realized that the wings were still folded.

There were, I suppose, three possible courses of action: (1) try to spread the wings; (2) try to get the thing back on the ground with wings folded; (3) eject —this being R. Bacon's selection.

Lt Barnes decided on (2) and successfully landed the F8U back at base. The US Navy believe that this is the first time such a thing has been done, suggesting that the absent-minded Lt Barnes will get a pat on the back as well as a disciplinary raspberry.

Of all the comments on this I particularly liked the one attributed to John Cunningham, as solicited by an enterprising reporter on *The Daily Telegraph*. DH's director and chief test pilot said he thought it was "indeed a remarkable performance," adding with a chuckle: "I should say that this was something which perhaps only an American could do. You can take that which way you like."

● Channel Air Bridge missed an opportunity to cap their rivals Silver City in the correspondence columns of *The Times* (see this page last week).

Under the heading "Tunnel Or Bridge?" they should have written to the editor: "Sir—There already is a bridge. Yours faithfully."

● What is the value of goodwill? BOAC's 1959-60 report, noting that the BOAC Associated Companies' share of Malayan Airways' profit was £5,151, says: "In both years the item of Goodwill which in fact represents the value of the aircraft was written down in such amounts as, on that scale, would extinguish the item in 5 years."

Query No 1: How can fleet value be equated with Goodwill (capital G or not)?

Query No 2: Is it really Malayan Airways' intention to extinguish the item Goodwill over the next five years?

I am assured that the answer to these questions is quite simple. When BOAC, Qantas and the Malayan, Singapore and Borneo governments took over the airline, the fleet value had been depreciated to zero. But obviously the fleet still had a market price, and Malayan Airways weren't going to give it to BOAC and partners for nothing. So, as a book-keeping convenience, fleet value was equated with the airline's goodwill, which was in effect what BOAC and partners were buying.

"The only goodwill that's going to be written off," a BOAC Associated Companies' spokesman assured me last week, "is the book-keeping item."

Click went the shutter of *Flight's* camera, and out came a picture of which this is a small detail. Who is the saintly glider pilot? For the whole picture see page 216

● I thought twice about ringing Sir Charles Boost for his views on the new BOAC chairman's suggestion that Britain must win the supersonic airliner race. After all, Sir Matthew Slattery is careful to acknowledge the disadvantages of the supersonic airliner—and he is saying something *positive*, even if he doesn't mention BOAC's £15 million accumulated deficit.

But instead of sponsoring a scramble for the supersonic airliner, should not Sir Matthew have first tried to get everyone to walk out to the thing in an orderly way? Anyway, he has said what he thinks, rightly or wrongly, and evidently regardless of what the Ministry thinks. Thank goodness there is one man in British aviation who isn't scared of doing that.

I rather liked *The Economist's* heading to its comment on Sir Matthew's views. Expressing succinctly the feelings of all those who shudder at the prospect of history—quite recent history —being repeated, it read simply: "Wait For It."

* * *

But my staff have had hundreds of phone calls this week enquiring about Sir Charles Boost's reactions to the BOAC chairman's supersonic remarks. So I just had to ring him. Unfortunately, according to his public relations officer, he has been ordered to rest after a three-day supersonic celebration party at Imperial British Air Power House. But, said the spokesman, he could tell me that Sir Charles is "terribly excited."

● "I don't want to fly to New York in two and a half hours."—*Sir Matthew Slattery, chairman of BOAC.*

● A reader, after seeing my July 29 piece on the historical accuracy of a Battle of Britain pilot-author, writes: One hundred lines yourself—Bf109, *not* Me109!

Author R. Bacon [grudgingly]: Oh, all *right*.

● Here we go again—a new aeronautical term is devalued almost before it is accepted. I refer to "second-generation," as applied by Vickers to the Vanguard and VC10, and by de Havilland to the D.H.121. In the latest edition of *Boeing Magazine*, the 720 is described as "second generation."

By this measure, I suppose, the Viscount 810 is a fourth-generation turboprop and TCA's Vanguards are sixth-generation turboprops.

* * *

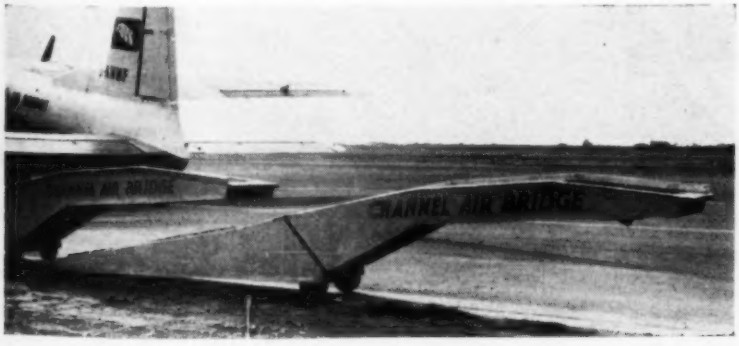
Talking about generations, Sir Roy Fedden says in so many words that if Britain doesn't get cracking on a space programme soon, "generations yet unborn will never forgive us." That's all very well, and perhaps this is one of the best reasons yet put forward for a British space programme. But how are we going to get these unborn generations to contribute some £ s d?

Englishization

● Now being tested on TWA jet flights between New York and Los Angeles, says TWA, is "a new concept of containerization."

ROGER BACON

I confess that this *Flight* picture is slightly less spontaneous than the one above. It's a contribution to the cross-Channel "tunnel or bridge?" controversy. Mr Mekie of Silver City asks "why either?" while his rivals in British United Airways appear to have already solved the controversy. See second item on this page



PRESTWICK IS TWENTY-FIVE

A time for looking ahead

"Capt E. P. M. Eves walked across to the duty pilot's office to report. Answering routine questions, he said that he had come from Gander after a flight of 10hr 45min. 'That seems a long flight,' remarked the duty pilot. 'Where is it that you've come from?' Then it dawned upon him that the captain had flown the Atlantic. Other captains later noticed the good weather for landing at Prestwick and for this and other reasons the Atlantic Ferry's eastern terminal was officially transferred to that airfield."

THIS account from *Merchant Airmen*, the official Air Ministry account of civil aviation during the second world war, relates how Prestwick Airport—opened as a grass field in 1935 by the Duke of Hamilton and the late Gp Capt D. F. McIntyre (the first men to fly over Everest in 1933, and the founders of Scottish Aviation Ltd)—became the terminal for the British end of the Atlantic Air Ferry in 1941.

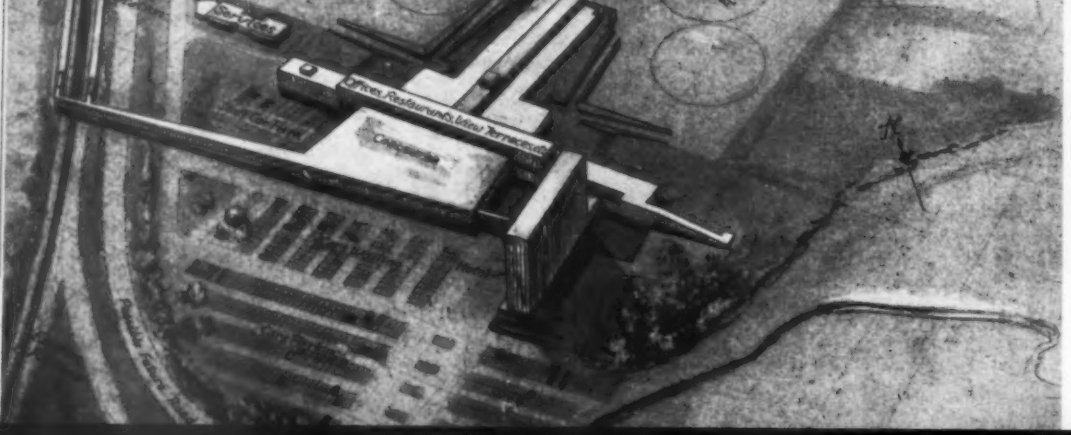
A 6,600ft runway was built in that year and a second 4,500ft runway was added in 1942. At the end of the war a Government White Paper confirmed that the now well-equipped terminal would be transferred to the MTCA and operated as an international transatlantic civil airport. It was taken over complete with the hotel that forms a part of the terminal buildings. The way in which traffic has grown since is shown in the table below; to accommodate it, the main runway has been progressively extended to 7,000ft, to 7,500ft with 1,000ft overrun and, in 1958, approval was obtained to extend this into a 9,800ft runway in time for the jet services planned by its five transatlantic operators—BOAC, SAS, KLM, PanAm and TCA. The contract was let to Richard Costain Ltd in September 1959, and the new runway was opened last May. Across it runs the trunk road from Ayr to Glasgow (see "Angry Prestwick Motorists," *Flight*, June 24), one of the highly controversial features of an airport that is developing not just as the No 1 transatlantic alternate to London (Prestwick has remained open when practically every other airfield in Europe was closed through fog) but as an airport in its own right.

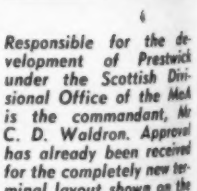
PRESTWICK'S PASSENGER TRAFFIC

1947	81,000	1955	208,000
1948	91,500	1956	243,000
1949	110,000	1957	260,000
1950	117,000	1958	218,500
1951	128,000	1959	243,600
1952	169,000	1960	About 370,000
1953	187,000	—	
1954	195,000	1963	About 600,000

The other controversy surrounds domestic services from Prestwick, which are extremely poor. Transit passengers are slightly in the majority and relative to the total number of passengers handled have increased over the past twelve months from 54 to 57 per cent. But from another aspect it can be said that traffic originating or terminating at Prestwick is increasing at a rate almost as great as the total figures for which, incidentally, exclude about 100,000 MATS travellers). These passengers originate from (and have destinations) all over the British Isles, but particularly comprise Scots businessmen and pay-their-own-way economy-class travellers with associations in the US and Canada.

There are thus some strong arguments for developing internal services through Prestwick beyond those at present operated to London by BOAC and TCA, by BOAC to Manchester, and by Scottish Airlines' seasonal service to the Isle of Man. Ayr County Council, who have co-operated closely in planning the development of Prestwick, have recently issued a manifesto, *The Future of Scottish Civil Aviation*, in which a case is strongly made for Prestwick rather than Abbotsinch taking over Glasgow's traffic when Renfrew closes. Although the council is shaky on some of its facts, the proposals would seem to make good sense for Prest-





Responsible for the development of Prestwick under the Scottish Divisional Office of the MoA is the commandant, Mr C. D. Waldron. Approval has already been received for the completely new terminal layout shown on the left in which advantage has been taken of natural contour to provide all-at-one-level access to the finger

The entire complex of buildings that now comprises Prestwick will disappear when the transfer to the new terminal and hotel is completed in 1963 and the taxiway will be extended to run parallel to the entire length of the main runway

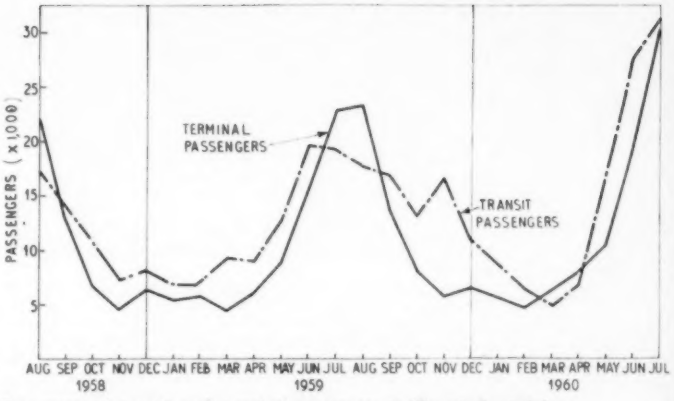
"Flight" photographs

The BOAC Boeing 707 in the heading picture opposite has a full 9,800ft ahead of it for take-off. Useability of the jet runway reckoned on a maximum crosswind component of 20kt is 98 per cent

wick's commercial future. The points made are: (1) Lack of internal air services from Prestwick inconveniences air travellers from abroad. (2) Prestwick is ready-made for Renfrew's traffic. Expenditure that would be necessary to develop Abbotsinch could be saved. (3) Renfrew last year lost £300,000 and it would not be financially sound to replace it with another airport carrying a similar deficit; it would be more sensible to group the traffic at Prestwick [which last year showed a deficit of £0.5m on an expenditure of £1.1m]. (4) The greatest single objection to the use of Prestwick in place of Renfrew—a distance from Glasgow of about 30 miles—would be negated by the British Railways' proposal to provide a 30min diesel link direct to an airport station.

That these proposals have been seriously considered in the planning of the new airport is evident from the design of the new £1m terminal building, work upon which will start next summer and will be completed in the latter half of 1963. Construction of the new apron will start before Christmas. Intended to handle a maximum capacity of 1,500 passengers an hour the terminal and finger could without great difficulty be extended either upwards or sideways. As now designed Prestwick is unique among British airports in providing access to the apron at one level. The finger will be sunk into a shelving trench which is bridged for traverse by airport vehicles.

Two other important features of the big expansion are to be a new hotel and a railway station which, Gatwick-like, will be connected to the terminal by a covered way. Responsibility for the station and hotel has yet to be decided, although one point of view is that an hotel can contribute significantly towards making the airport a commercial proposition. These last two words occur repeatedly in discussions about Prestwick Airport and particular attention is being paid in the design of the new terminal to the provision of the concessions which provide a necessary supplement to airline revenue. Last year Prestwick had the distinction that a higher proportion of its revenue came from spectators than was the case at London Airport. Special provision is to be made for these important contributors to airport solvency, by means of a covered enclosure on top of the new terminal building. Prestwick was also the first British airport to have a duty-free liquor shop, and this and the apron and handling services which the airport is

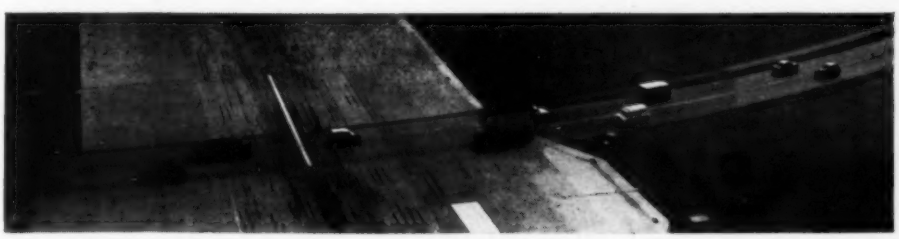


Two years of transit and terminal passenger traffic at Prestwick. Total traffic is a combination of these passengers and 100,000 passengers a year uplifted by MATS

again unique in providing are much-encouraged contributions to reducing that £½ million deficit.

Finally, what about the road system which has been the subject of such controversy? The apparently obvious solution of tunnelling the Ayr - Glasgow road under the runway was rejected by a former Minister of Aviation, Mr Harold Watkinson, after a special parliamentary commission had been appointed to investigate the problem. A new road by-passing the airport, Ayr and Prestwick is to be opened next month, but although there is a plan to divert traffic from the two towns to the west of the main runway no decision has yet been taken. Until it has, traffic will presumably continue to cross the runway and continue to be delayed when it is in use.

A. T. P.



This undesirable confluence of road and runway must continue until the Ayr and Prestwick by-pass is completed to the east of the airport and a proposed new road from Prestwick is built alongside the railway line to the west

"Flight" photograph

Australian Light Aircraft

NEWCOMERS ENTER THE CLUB AND AGRICULTURAL MARKETS

By Stanley Brogden

WITH three Cessnas a week being sold in Australia through the very lively Rex Aviation Pty Ltd, of Sydney, and de Havilland really getting going on their Beechcraft sales drive, the Australian light aircraft and business aircraft market is developing very quickly. The Cessna success is such that the American firm is now seriously considering the possibility of production in Australia and a team will visit Sydney shortly to make a survey of the potential.

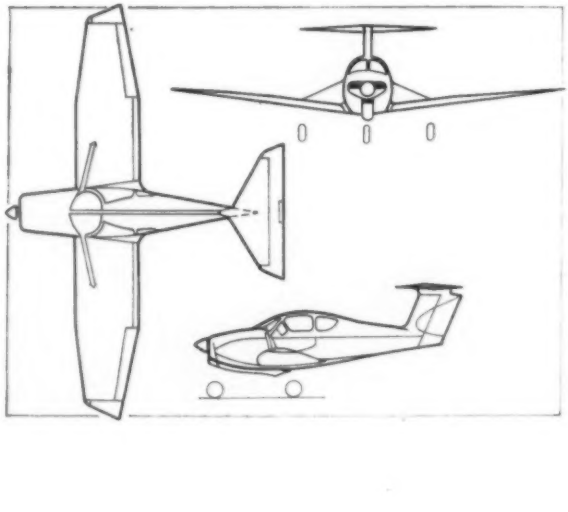
In Western Australia, a Perth firm new to the aircraft business is considering an approach to Lockheed International for rights to produce the LA-60 in Perth. This aircraft is already arousing great interest in Australia because the rumoured price simply beats anything else in the field.

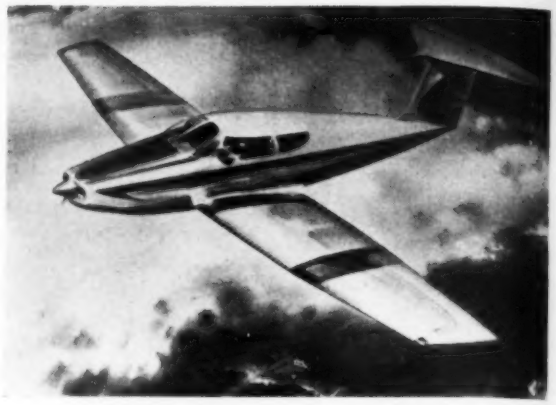
One wonders why Commonwealth Aircraft Corporation does not go into production with a licensed overseas light aircraft or a local design; the sadly neglected Millicer Air Tourer comes to mind. CAC awaits an RAAF order. It has geared itself entirely to Air Force orders—the Navy has never helped the local industry and, as I have said in a previous article, if there are no Government orders CAC will quietly go out of business. Its future depends on the Government decision whether to buy the new supersonic jet fighter overseas or build it here. CAC has never really got down to the problem of diversification (horrible word), which de Havilland have done successfully here. Attempts to get into the prefabricated-house field were smashed in the 1940s by the unions and the building trade. Some attempt was made in the 1950s, when Air Marshal Sir George Jones was at CAC, to design and get advance orders for a light transport and a small helicopter; but somehow one never gained the impression CAC really meant it.

CAC is now producing the Ceres agricultural aircraft, a redesign of the Wirraway, but the CAC overheads are so great that an unrealistic price has kept sales down. The agricultural operators just won't have it. Big overheads are one of the reasons for the big manufacturers dodging the small-aircraft field—Lockheed just could not produce the LA-60 in the USA on this account.

In Australia it looks very much as if the small-aircraft field will be taken over by newcomers who have no cramping overheads and, moreover, no biases or inhibitions. They will bring an entirely new approach. Most prominent of these newcomers is Victa Consolidated Industries, a Sydney firm which has created a

General arrangement of the prototype Victa R-2





Artist's impression of one of the newcomers, the Victa R-2

reputation as manufacturers of the mechanized lawnmower. Victa is a very successful and financially lush organization, whose managing-director, M. V. Richardson, started the business in his backyard in 1951 to combine the humble lawnmower and the internal combustion engine. He has made a fortune freeing the Australian married male to give more time to "footy" and the races. His first interest in flying was evinced by purchase of a Cessna 182B and a Colonial Skimmer to get his salesmen around the State.

Victa has the money and it has the plant. The prototype of a high-performance four-seat light aircraft is now being built in the mower factory at Milperra, near the aerodrome at Bankstown. The prototype should fly later this year; deliveries will follow early next year if all goes well with test-flying and a C of A is gained without too many modifications. Powered by a 180 h.p. Lycoming O-360, the Victa R-2 will have a McCauley constant-speed propeller. The prototype will have a retractable tricycle undercarriage but one of the production versions may have a fixed undercarriage for tough bush operation. There will be dual control in the production model, but while the prototype will have two doors the production model will have only one. The R-2 will be a low-wing monoplane, entirely metal, for DCA frowns on any wood in aircraft here.

Victa knew the local requirements were for a cheap aircraft with speed and range; and they hope to sell the R-2 for roughly £A5,500. It will cruise at 174 m.p.h. (5,000ft, 75 per cent power) and have a maximum range at 5,000ft of 740 miles. Control is said to be improved by a high-mounted tail surface, while wingtips and tailplane tips are raked to reduce vortices. There will be dual control, and full aerobatic capability (two seats occupied) is promised. The production model may be a fully cantilever monoplane, but the prototype has a strut-braced wing. The high strength-factor inherent in the design makes the R-2 a promising design from the Australian standpoint; it is aimed at the grazier and sporting pilot as well as at the businessman.

The R-2 will weigh 1,190lb empty and 2,250lb gross. Wing area is 132 sq ft, span 32ft, aspect ratio 7.7, mean chord 4.13ft, length 21.6ft, tailplane height 8.3ft, and wing loading 17 lb/sq ft. With four seats filled the aircraft will carry 80lb of luggage and 40gal of fuel. Stall is at 56 m.p.h. i.a.s. at sea-level flaps up, 48 m.p.h. flaps down. Ceiling is given as somewhere between 16,600ft and 18,200ft, while maximum climb is 820ft/min. Take-off minimum is 180-200yd, with 370yd to clear 50ft. Landing run, clearing a 50ft obstacle, is given as 190yd.

About five aircraft will be constructed as a pre-production run at the Milperra factory. Then, if orders develop, a new factory will be built to accommodate with a proper production line. Decision on production tooling will be made next year as orders progress.

I understand that Victa have a group of designs, probably four, which could see the prototype stage later on. There is, of course, a crying need for a cheap two-seat sports and training aircraft in Australia.

At present the agricultural market is attracting most of the newcomers. The old firm in this business—Kingsford Smith Aviation Service, at Bankstown, near Sydney—is rather disheartened. Five types of their Cropmaster are in service, the newest version having a 250 h.p. Lycoming O-540 instead of the 170 h.p. Scarab, and a tricycle undercarriage. The PL-7 boom-tail tanker appeared to be a winner in the prototype stage, but it was abandoned through lack of finance to pursue the design problems.

Austerserve Pty Ltd, a subsidiary of Kingsford Smith, are converting Austers. The Autocar has been re-engined with a 180 h.p. Lycoming and with other modifications makes the Bushmaster.

The Kingsmith is an Autocar with a 150 h.p. Lycoming and the Super-Autocar has a 220 h.p. Continental.

A very interesting Kingsford Smith project is their version of the EP-9 Prospector, with a Cheetah 10. With 20 years in the business, Kingsford Smith are game, though a little disheartened by life. They certainly have not had it lucky.

Yeoman Aviation Pty Ltd, also at Bankstown, is a new firm with a fine agricultural type called the YA-1 Cropmaster, specially designed for the agricultural market. They sold one to Aerial Spraying and Spreading Ltd at Albury before it was built and it is well on the way to 200 hours already. It has been designed right from the start for the one job, not being a rehash, or a flexible jack-of-all-trades like many other light aircraft. The team which designed it had been engaged in spraying and dusting all over Australasia for many years. The YA-1 is an all-metal low-wing cantilever monoplane, with tricycle undercarriage, a 250 h.p. Lycoming O-540 and a Hartzell CS propeller. The heavy-gauge sheet aluminium hopper inside the fuselage has a 22 cu ft capacity and is stressed for 12g. Span is 34ft, length 26½ft, aspect ratio 6.5 and wheel track 8ft. The prototype has a tailwheel and two aircraft have been built for orders that way, but the production model is definitely tricycle.

The Cropmaster is priced at £A8,000, a fair price for a 3,000lb gross-weight aircraft these days. Having made its first flight on January 15 this year, it is a new type in every sense of the word.

Queensland, a State with more open spaces than most of Europe, has a contribution in the Southern Cross Aviation SC-1 four-seat, all-metal tourer. This has been designed for the private owner, but the company has agricultural hopes. The aircraft is powered by a 180-h.p. Lycoming and cruises at 160 m.p.h. There have been some design changes recently; but Southern Cross, founded in 1957, hopes that from its base at Toowoomba it may set out to conquer Australia.

Down in Melbourne there is the Jackeroo, an adaptation of Ray Stitz's basic light two-seater. This is an attempt by a Melbourne businessman, Norman Hamilton, to give Australia a light sports and training aircraft at under £2,000—he quotes £1,950. It would have STOL capabilities and cruise at 80kt. Aero club executives who have seen it at Moorabbin like it, but naturally it is no luxury aircraft. It is a basic aeroplane in every way. Mr Hamilton, who is the local representative for Porsche, hopes to make some hundreds.

At the moment, the sports, business and other 2/10-seat aircraft market is worth about £1,000,000 a year in Australia, and nearly all this nice sum is going abroad. Australians see no reason why a good percentage should not remain in their country and help build up what could well be a very sizeable industry.

Correspondence

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.

Probe Probed

YOUR photograph, on page 154 of *Flight* for July 29, of a Gloster Javelin FAW.9 refuelling from a Valiant prompts me to comment on the dimensions of the Javelin's refuelling probe.

Is it really necessary to have a probe almost thirty feet long, standing proud of the fuselage throughout its entire length? Would it not have been possible to have had one of those neat little things that lies tucked away in a flush fairing on the fuselage flank until required, as on the Chance Vought Crusader? If this were impossible, surely there could be no objection to a mere six-footer in that capacious starboard wing root.

One wonders how the performance of combat aircraft is affected by the numerous drag-producing excrescences sported by so many of them nowadays. Could the Javelin FAW.9 of today, with its thirty-foot probe, four missile pylons, four Firestreaks, two drop tanks and afterburning Sapphires of 24,600lb total available thrust, really outpace the first prototype Javelin (WD804) of nearly nine years ago on its early Sapphires of only 16,600lb total available thrust? I suppose the former represents the development potential inherent in the latter, but in the very process of this alleged development is not something lost in the matter of pure m.p.h., climb rate, service ceiling and handling characteristics, in spite of the increase in fire-power and range? In any event, the festooning of the Javelin like a Christmas tree with drop tanks and missiles can scarcely be conducive to good area-ruling, which I believe is important to even high-subsonic aircraft as well as to their supersonic brethren.

Exeter, Devon JEREMY C. BRIGHT

Chronology and Calendars

ON picking up a copy of the May 6 issue of *Flight* today I noted the letter from Mr Gibbs-Smith regarding Mr Meos's notes on the early Russian flier Yefimov (I think this is a preferable transliteration to Efimov, as an initial "E" rather than "Ye" is rather rare). It led to a train of thought which may perhaps contain a couple of useful suggestions for students.

Mr Gibbs-Smith mentions that Yefimov was at Odessa on March 30 and in Châlons on April 2. Now it is an agreed historical fact that railway trains were faster fifty years ago than they are today, but it seems that a very great effort would have been necessary to effect this translation in three days. However, I would like to suggest that the flier was first in Châlons and later in Odessa. A point to bear in mind when dealing with Russian chronology of the Tsarist epoch is that the calendar used was the Julian (old style), about 12 days behind the Gregorian (new style) which much of the rest of Europe adopted a century or so before. The reports from the Russian Press would be old-style dates, and those in the French Press would be new-style. So the Odessa date may have been about a week *later* than the Châlons date.

Without the opportunity to refer to the sources, I can only offer this as a suggestion, but references to dates should be clarified where confusion might arise. It was only in mid-1918 that the Bolshevik Russian government adopted the Gregorian calendar.

Another dating problem arises from the American custom of writing dates as numbers in the order month-day-year, and not as the British and nearly all other nations do, using day-month-year.

Thus, 2-5-42 is February 5, 1942, to the American, and May 2, 1942, to the Englishman. The latter is generally only foxed by something like 2-25-42. I have already seen contradictions arise in the aeronautical Press because of these differing conventions.

Finally, it should be borne in mind that a billion is 1,000 times larger in England than in the USA.

New York 58 DENYS J. VOADEN

Light-aircraft Delivery to NZ

I READ with much interest Mr D. M. Bay's letter [July 22] concerning a claim that a recent Apache flight to New Zealand was the first sales delivery of a light aircraft out there.

Mr Bay's facts are indeed correct. My firm supplied the Proctor V G-AHWW to Capt Bradshaw in 1948 and he flew it all the way out from Dunsfold. Originally he had intended to fly the Tasman from Tasmania but later made the crossing from Sydney to Invercargill.

Several other New Zealanders have flown their aircraft out to Australia after purchase and deck-shipped them over the Tasman, but Bradshaw was definitely the first to go the whole way, not even stopping at Norfolk or Lord Howe Island.

London W1 W. S. SHACKLETON

RNAS Airship Memories

THE article in your issue of June 10 by my one-time wireless officer, M. J. Golightly, brought back memories. I was the wireless operator of HM Airship SS.Z7 and can therefore confirm this story, except that we were flying straight and level in dense mist at the time of our collision with SS.Z10. Our first indication of pending trouble was when my Aldis lamp picked up the nose of Z10 and my skipper, Flt Lt Swallow, opened up the engine and elevated in an effort to steer clear.

Incidentally, should you publish this letter, and any old Polegate men see it, I should be glad to hear from them with a view to getting together again.

Slough, Bucks V. DODD, OBE

[Our correspondent's full address is: 312 Stoke Poges Lane, Slough, Bucks.—Ed.]

FORTHCOMING EVENTS

Aug. 7-17. Bulgarian Aero Club: World Parachuting Championships, Moustachevo, near Sofia.
Aug. 14. Elstree Flying Club: Tea Patrol.
Aug. 17. Kronfeld Club: Talk on National Gliding Week.
Aug. 17. Kronfeld Club: "The RAF and Inter-Service Championships," by W. Kahn, and "The Yorkshire National Gliding Week," by G. Harwood.
Aug. 20-21. Pescara Aero Club Rally.
Aug. 21. Colmar Aero Club: Alsace Wine Rally.
Aug. 27. Luton Flying Club Display, Luton Airport.
Aug. 28. Oxford Aeroplane Club At Home, Kidlington.
Aug. 28-Sept. 4. Czech Aero Club: World Aerobatic Championships.
Aug. 31. Kronfeld Club: Lectures on the Coventry and London National Gliding Weeks.
Sept. 3-5. French and Savoy Aero Clubs: International Centenary Rally, Aix-les-Bains.
Sept. 4. Wolverhampton Aero Club At Home.
Sept. 5-11. SBAC Display and Exhibition, Farnborough.
Sept. 7. Kronfeld Club: "To over 25,000ft," by Flt Lt G. Rondel and Plt Off I. Strachan.
Sept. 8-12. AGARD and Instituto Lombardo di Scienze e Lettere: Seminar on Propulsion for Astronautics, Varenna.
Sept. 9-12. Popular Flying Association Rally, Cranfield.

THE INDUSTRY

Gp Capt Wroath's New Post

ROLLS-ROYCE LTD announce that Gp Capt S. Wroath, CBE, AFC and Bar, AFRAeS, RAF (Retd.), has joined the technical sales department of their Aero Engine Division, where he will be concerned with military powerplants.

Gp Capt Wroath joined the RAF in 1925 as an engineering apprentice at Halton, transferring to flying duties in 1931. During most of his Service career he has been associated with test flying, first as a test pilot and then, in 1943, when he had the responsibility of forming the Test Pilot's School at Boscombe Down, later to become the Empire Test Pilots' School. He subsequently did two tours of duty in the USA, the first as chief British test pilot responsible for liaison and flight testing of American aircraft on behalf of this country, and the second in connection with operational proving schedules. From 1953 to 1957 Gp Capt Wroath was back at the ETPS as commandant, and on his retirement from the Service in the latter year he joined Blackburn & General Aircraft for liaison duties in connection with the NA.39. During his Service career he completed some 4,500 hours' flying on approximately 300 different types.

Data Processing Service

AN organization which can perform data processing on a commercial basis has been set up by de Havilland Propellers Ltd at their factory at Stevenage, Herts. This is believed to be the first such service to be made generally available to industry in the South of England.

Trained operators and duplicate sets of equipment can rapidly and accurately transfer raw data from strip chart records on film or paper to standard punched cards, to punched paper tape, or into tables. The punched cards or tape may then be fed into a suitable computor elsewhere. Alternatively, if the information is presented on punched cards or tape it can be automatically displayed, up to six variables being plotted together on a common base scale. Handling rates in either case are normally in excess of 800 points per hour, state the company, and the system is notable for its flexibility.

This service should be of particular interest to those already using punched card or tape systems and who require batches of information to be transposed quickly and at low cost without having to install and operate complex equipment. Work has already been undertaken for the Central Electricity Generating Board, the UK Atomic Energy Authority, and several missile contractors.

BAC Publicity Appointments

BRITISH AIRCRAFT CORPORATION LTD announce that Mr Charles Gardner, OBE, has been appointed as their publicity manager. He will be responsible for all publicity, advertising, sales publicity material and public relations for BAC and its products. On aircraft matters he will be responsible to Mr A. H. C. Greenwood, chairman of the Corporation's joint sales committee, and on guided weapons to Mr Eric Beverley, sales manager, guided weapons.

Mr Gardner's previous post was that of sales publicity manager for Vickers-Armstrongs (Aircraft) Ltd. He joined them at Weybridge in 1953, and had previously been with the BBC for many years. During the war he was a Coastal Command pilot and later held staff appointments, attaining the rank of wing commander.

Consequent upon Mr Gardner's appointment, Mr Robert J. Blackburn becomes sales publicity manager of Vickers-Armstrongs (Aircraft) and Mr John H. Motum has been appointed deputy sales publicity manager. Mr Blackburn joined Vickers-Armstrongs (Aircraft) Ltd in 1956. Previously he had spent nine years with the editorial staff of *Flight*, including four years in charge of the commercial aviation section of the journal. He has flown light aircraft as a club pilot, and from 1946 to 1948 served in the RAF as an engine fitter on jet aircraft. Mr Motum went to the company in 1957, and was previously with the service department of Bristol Aircraft Ltd, which company he joined as a student apprentice in 1940. From 1943 to 1947 he served as a navigator with Coastal and Transport Commands.

A non-technical but convincing demonstration of the capabilities of the Magnoptic Revelation comparator, from the range of optical inspection instruments made by Heston Aircraft & Associated Engineers Ltd, of Heston Airport, Hounslow, Middx. A combined profile projector and epidiascope, it can be used for such otherwise difficult tasks as profile and surface examination of the walls and bases of holes to a depth of 3in. The lamps are freely adjustable

IN BRIEF

Mr F. E. Sparkes, ARAeS, AMSLAE, formerly of the BOAC Technical Branch, has joined the staff of Electrolube Ltd, 16 Berkeley Street, London W1, as technical manager.

CIBA (A.R.L.) Ltd, Duxford, Cambs, have produced an attractive new illustrated brochure about their premises and products, *Introduction to Duxford and to the products of CIBA (A.R.L.) Ltd.*

Dr G. L. J. Bailey relinquishes his position as superintendent of Mond Nickel's development and research laboratory in Birmingham and transfers to London to become manager of research. Mr E. J. Bradbury succeeds him in his former post.

Mr J. E. Marjoram, AMIMechE, AIWM, formerly a senior mechanical engineer working on the Blue Streak LRBM, has been appointed chief engineer of Aeropreen Products Ltd at High Wycombe, Bucks.

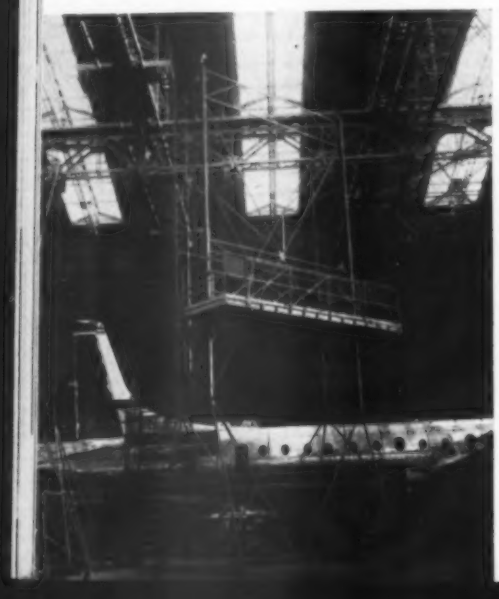
Cambridge Instrument Co Ltd, Cambridge House, Grosvenor Place, London SW1, have announced the 100 per cent acceptance of their offer to the shareholders of Electronic Instruments Ltd, Richmond, Surrey, and the completion of the merger between the two companies.

Refrasil heat-insulating blanket, well known in aircraft practice, is used in Donald Campbell's new Bluebird car to insulate the four-branch exhaust system of the Bristol Siddeley Proteus engine from the body structure and the rear-wheel drive shafts. Refrasil is marketed by the British Refrasil Co Ltd, Stillington, Co Durham.

Mr Eric Summer has been appointed chairman of Royston Industries Ltd, parent company of Royston Instruments Ltd, whose products include the Midas system of airborne data recording. Mr Summer is senior partner of Summer & Co and a director of Robert Fraser & Partners Ltd and of A.C.E. Machinery Ltd.

Mr Paul Worth, director of Dunlop Advisory Services, has retired. He joined the India Tire & Rubber Co in 1920 and was works director when it was acquired by Dunlop in 1936. During the last war the factory was responsible for producing about 21 per cent of the aircraft tyres used by the RAF. Mr Worth retired from the India Co in 1957 and joined Dunlop Advisory Services.

Beginning in October, Bristol Aircraft Ltd are providing facilities for graduate mathematicians and physicists to attend a special one-year post-graduate residential course in aeronautical engineering at the College of Aeronautics. On completing the course, trainees will be given appointments with Bristol Aircraft as aerodynamicists, structures designers or systems engineers at salaries which will take into account their extra training.



For servicing Britannia tail units, Bristol Aircraft have constructed this mobile adjustable staging, the working platform of which can be elevated from 15ft to 35ft 6in under the control of the men (up to four, plus 450lb of equipment) on the platform. Power is provided by a modified Atlas Copco MLB 52 air hoist